THE AMERICAN GAS LIGHT JOURNAL

PUBLISHED WEEKLY, AT No. 42 PINE STREET.

VOLUME XCVIII., No. 23.
Whole No. 1,983.

NEW YORK, MONDAY, JUNE 9, 1913.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

INDEX TO CONTENTS, PAGE 365. - - - - - - - - - ADVERTISERS' INDEX, PAGE 24.

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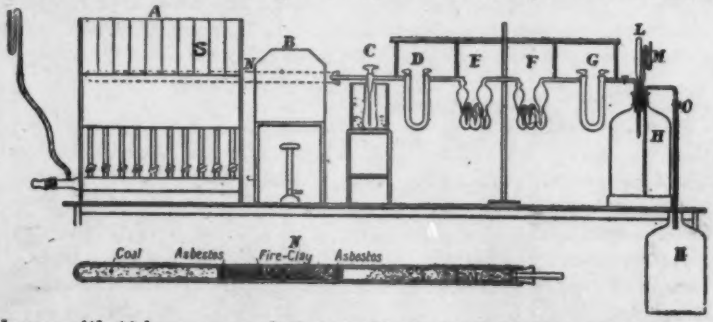
CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

*A Laboratory Method of Fractionating Coal to Determine its Output of Gas and By-Products..... 365
*The New Coal Gas Plant at Atlanta, Ga., by Mr. R. C. Congdon.. 366
*The Manufacture of Gas from Sewage Sludge, by "J. A. D."..... 367
Proceedings, Forty-third Meeting, New England Association of Gas Engineers—Official Report—Continued from page 359 368
Second Day, Morning Session—Some Notes on Vertical Retorts, at Derby, Conn., by Mr. C. H. Nettleton—Discussion—Coal Gas? Surely. But How? by Mr. R. B. Brown—Discussion.
EDITORIALS—
Briefly Told..... 372
May Meeting, Philadelphia Gas Works' Section, N. C. G. A.—Fourth Annual Golf Tournament, Gas and Electric Companies, New York City—Mr. Nettleton's Statement Respecting Carbonization Practice at Derby, Conn.—Mr. Barnes to Represent Messrs. Bayley & Sons.—Current Mention.
CORRESPONDENCE—
Some Production Figures, from Hull, England 373
It Should Have Been Ten, Not One..... 373
Book Reviews..... 373
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 378
Mr. V. L. Elbert Goes to St. Joseph, Mo.—Something from Wenatchee, Wash.—Contract foa the Gas Machinery Company—Pennsburg Company Reorganized—Mr. Learned Goes Abroad—The Louisville Merger is Sustained—Alumni Day, Stevens Institute—Still in Abeyance, Haverhill (Mass.) Status—Cheaper Gas for Quincy, Mass.—The Washington (D. C.) Company, Purchases Analostan Island—Binghamton, N. Y., Wants Cheaper Gas—Growling Over the Ocean Grove (N. J.) Gas Rate—Personal—Mr. G. R. Stetson Goes Abroad—New Gas Schedule, Green Bay, Wis.—Mr. Volivà is Boss—In the Hands of a Receiver—Gas for Rock Hill, S. C.—New Plant for Norfolk, Va.—Death of Mr. J. J. Duncan—And Other Items.
The Market for Gas Securities..... 380
Meeting Times of the Various Gas Associations..... 380
Public Lighting Table for June, 1913 (Advertising Section)..... 10

A Laboratory Method of Fractionating Coal to Determine Its Output of Gas and By-Products.

Herr Q. Schramm, in an article on this subject, published in the *Journal fuer Gasbeleuchtung*, notes that the coal sample is distilled in a horizontal glass tube, the details of the apparatus appearing in the illustration. Referring thereto, *A* is an oven, about 14 inches



long, with 10 burners, and 10 movable firebrick baffles, *S*, the supply pipe to the burners carrying a U-gauge, in order that the gas pressure may be kept constant. One end of the distilling tube, *N*, projecting from the wall of the oven, passes through a steam bath, *B*, the bath being heated by an independent burner. *C*, is a flask containing dilute sulphuric acid, immersed in ice or a water bath, the acid being tinted with a little methyl orange, so as to avoid possible confusion with the other solutions. *D* is a calcium chloride tube, to catch any moisture passing from *C*. *E* and *F* are flasks of caustic potash for a absorbing carbonic acid, etc., and *G* a calcium chloride tube for stopping loss of moisture from them. *H* is the bottle in which the gas is collected, and should hold about 0.35 cubic foot. *L* is the thermometer and *M*, the mercury gauge. *K* is a bottle for the water displaced from *H* by the gas. The distilling tube, 20 inches long and ½ inch in diameter, is hermetically sealed at one end. In making a determination, 15 grammes of dried, pulverized coal are put in the end of the tube, and a wad of previously ignited asbestos pressed lightly upon it. Next, a few inches of granulated fire-clay, covered by a second asbestos wad; the fireclay being intended to act similarly to the walls of a retort, in breaking up the ammonia, etc.; then a short vacant space is left, the balance of the tube being filled with loosely packed, absorbent cotton, previously dried and weighed.

The completely charged tube is shown at the bottom of the cut.

The different parts of the apparatus are now connected with rubber tubing, the bottle, *H*, filled with water, and the pinch-cock, *O*, opened. Water will start to syphon from *H* to *K*, and, if joints are all tight, *O* is closed, leaving apparatus under a slight vacuum. If the gas evolved shows pressure on the gauge, *M*, the cock, *O*, is opened again to relieve it.

The burner under the steam bath is now lighted; then, those under the fireclay in the tube; next, that under the asbestos plug against the coal; then, successively, the burners under the coal, allowing 10 to 15 minutes between the lighting of adjoining burners. The fireclay baffle over each burner is closed when the burner is lighted. Care must be exercised to see that the distillation proceeds quietly and uniformly, its completion being indicated, when gas generation becomes very slow. The water displaced into *K* is now measured, and the temperature of the gas collected in *H*, besides the vacuum indicated by the gauge *M*, and the barometric pressure noted. The cocks are now closed, the burners extinguished, and the tube allowed to cool.

The results are calculated as follows: The increase of C + D gives the yield of gas liquor; the increase of E + F + G, gives the production of CO_2 + H_2S + HCN.

The tube is broken by filing at the second asbestos plug, and the tar therein determined by washing out and weighing. The contents of *C* are washed into a beaker and tested to determine the amount of ammonia in it. The coke remaining in the tube is weighed. The contents of *E* and *F* are made up to 100cc. by the addition of water, and analyzed for the quantities of HCN, H_2S and CO_2. The volume of gas in a ton of the coal is given by the volume of water displaced into *K*, × 100 × 1,000 ÷ 15, corrected for vacuum and temperature. For instance, if

Water displaced per ton.....	334 Cubic meters.
Barometer.....	748 M.M.
Temperature of Gas.....	13° C. [=vapor tension of 11 M.M.]
Vacuum at finish of distillation.....	50 M.M.
Then the real pressure is.....	748—[11 + 50] = 687 M.M.;
and the Gas corrected to.....	760 M.M. pressure,

and 0° C. would be:

$$\frac{334 \times 687 \text{ cubic meters}}{760 \times \frac{273}{273 + 13}} = \text{Cubic meters.}$$

When the user has had some experience with the apparatus, and can compare some of his results with actual working results from the same coal, he can take a sample of a new coal and determine, with reasonable accuracy, what may be expected from it in works' practice.

The New Coal Gas Plant at Atlanta, Ga.

[A paper read by Mr. R. C. Congdon, at the Meeting of the Southern Gas Association, April, 1913.]

Before making the recent changes in our coal gas installation our plant consisted of 22 full depth benches of 9's, 10 of the arches having been in service for a period of about 15 years and the remaining twelve, 7 years. The benches were built by the Parker-Russell Mining and Manufacturing Company. The 10 old arches had stood up well but were not in sufficiently good condition to warrant further refilling. The new arches were in much better shape and the party walls will be retained. The 22 benches had been operated with negro labor, using hand charging-scoops. Coal was brought into the retort house in iron wagons holding 1,000 pounds each, filled in the coal shed by shoveling from stock. The cars were moved on tracks which led to a Ridgway elevator, which in turn brought the coal to the operating floor of the retort house. We drew the coke into McDonald-Mann hoppers under the floor, and hauled it to storage, in Hunt buggies on an industrial railway. To get coke to the water gas plant we used conical shaped buggies into which unquenched coke was drawn, and pulled by negro labor to the generators. Most of our methods were out-of-date, and it was necessary to make radical changes.

We had little hope, considering our conditions, of installing vertical retorts, but watched with much interest results obtained at Manchester and elsewhere. We were particularly interested in the horizontal installation at Worcester. It was my privilege to inspect the Worcester plant, and I was very favorably impressed with what I saw. I liked the combination charging and discharging machine, and studied how this plant could be modified to suit our general layout. The Worcester machine had not been designed to charge and discharge a 20-foot retort, and as I decided to remodel our stack so as to make 11 through benches of 9's, having retorts 21 feet 7 inches long, I was led to study other machines which could meet the required duty.

The DeBrower machine and the Fiddes-Aldridge machine received our careful consideration, and, after going to England to see the latter machine in operation, I decided to purchase one for Atlanta, and our order was given to the Parker Russell Company, the agents for the machine in this country. Everywhere I saw the machine I was impressed with its smooth running, ease of operation, and the absolute satisfaction of the engineer in charge. It was especially gratifying to learn of the very few repairs required. In one instance I was shown many essential parts held in stock, which after 2½ years operating had not been used. Having decided on the type of bench and machine our next consideration was coal and coke handling equipment. A continuous overhead bin, with doors to engage with the machine, we decided was the ideal arrangement, and to bring the coal from the shed to the bin, we installed a Jeffrey scraper-conveyor, operated by a 20-horse power motor. This conveyor will handle in 8 hours all the coal we require for the 24 hour period. The coal is delivered direct from the cars into a hopper, from the bottom of which it passes through a reciprocating feeder and crusher, both of the Jeffrey Manufacturing Company's make, on to the conveyor. The coal is crushed to ½-inch size. For reclaiming coal from storage we use a Brown locomotive grabhoist, operated by current.

In the bottom of the overhead bin in the retort house are a number of patent doors, one door for each vertical tier of retorts. As the machine approaches a retort to be charged, it engages with the door overhead, opening it to take the charge into the hopper of the machine, and closing it when the machine is in position to charge the retort. The machine charges and discharges simultaneously. See Fig. 1.

The coke handling equipment consists of a Jeffrey scraper-conveyor, so arranged that it can be operated in either direction, there being a 15-horse power motor drive at each end. The coke, carried in one direction, is deposited in a steel reinforced bin, from which it is drawn by gravity over a screen and fed into coke sacks for local sale; operating the conveyor in the opposite direction, the coke falls hot, into water-cooled buggies of 1,500 pounds capacity. These buggies and the double conveyor arrangement are our own design

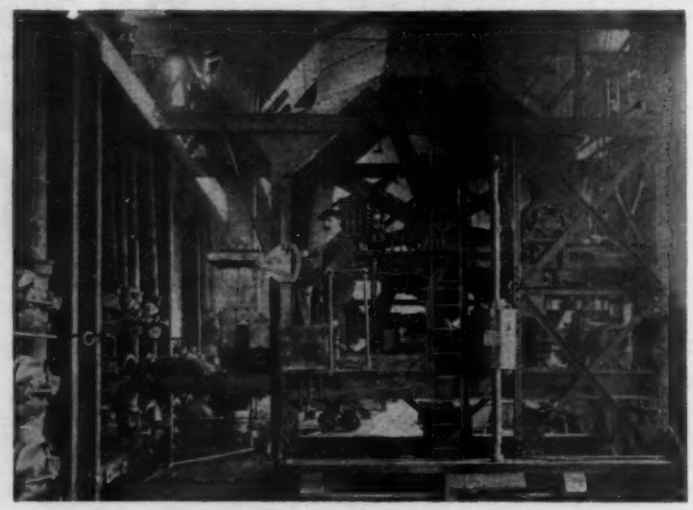


Fig. 1.—Fiddes-Aldridge Combination Charging and Discharging Machine. The Only Machine of this Kind in America.

and have proved to be entirely satisfactory. Our design includes also the industrial railway layout which provides an easy way to get the buggies from beneath the conveyor, and in a position to charge the three generators of the water gas machines. We use a storage battery locomotive to handle the buggies. See Fig. 2.

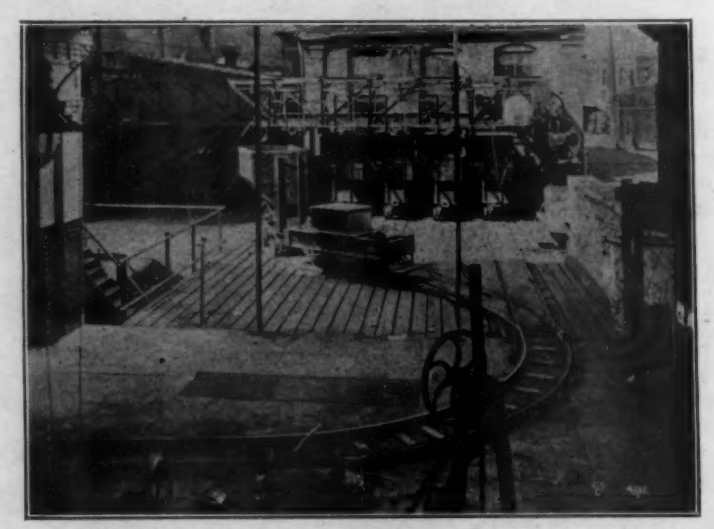


Fig. 2.—East End, End Coke Conveyor—Congdon-Whittaker Coke Handling System—Maximum Convenience, Minimum Labor.

We have to date installed only 6 of the 11 benches. These were built by the Parker-Russell Mining and Manufacturing Company, a description of which will be found in the American Gas Light Journal, October 21st, 1912. The contract for the remaining 5 benches has also been awarded the Parker-Russell Company, and the benches will be erected this summer. Various modifications will be made in the newer benches. The changes will include much larger furnaces, better arrangement for CO return, silica sectional retorts and settings, larger stoke holes, etc.

We very much regret that we are not at this time able to give a satisfactory record of results obtained over a long period, but the results covering a period of 1 month are as follows:

March, 1913:

Coal carbonized	6,928,710 pounds.
Coal gas made	34,698,000 cubic feet.
Yield per pound	5.01
Candle power	15.26
Candle feet	76.45
Average charge	1,330 pounds.
Length of charge	7 and 8 hours.
Gross B. T. U	626
Ammonia recovered, pounds per ton	4.30
Tar estimated at	12 gallons.
Coke 65 per cent	4,503,660 pounds.
Bench fuel 23.6 per cent. (largely estimated) of coal carbonized, pounds per ton	307

Other data:

Time required to charge and discharge 18 retorts.... 25 minutes.

Retort House Labor:

DAY SHIFT.

One retort house foreman and machine man.....	$3.33
Three lid men, average 15 cents, 12 hours	5.40
Two men on main and stand pipes.....	3.48
Two men on bench fires.....	3.24

NIGHT SHIFT.

One machine man	3.00
Three lid men.....	5.40
One man on main.....	1.92
Two men on bench fires, 11 hours.....	3.08
	$28.85
Average make per day.....	1,120,000 cubic feet.
Retort house labor per 1,000 feet....	2.58 cents.

ELECTRIC CURRENT USED ON COAL GAS MACHINERY.—KILOWATT HOURS.

	Nov.	Dec.	Jan.	Feb.	Mch.
No. 1. Coal crusher.....	670	1,300	730	520	620
No. 2. Coal crane	430	1,060	690	390	180
No. 3. Charging machine.	880	880	770	790	720
No. 4. Coke conveyor.....	1,660	1,430	1,480	1,490	1,340
No. 5. Coal conveyor.....	1,020	1,410	1,290	1,350	1,130
Total bill.....	$107.91	$127.08	$102.96	$97.29	$89.87
Coal carbonized (tons)....	3,703	3,414	3,081	2,879	3,464

Current used for electric storage battery locomotive for March: 300 K. W. H. November coal includes coal used in October 26th to 31st.

Note.—No extra labor required to get coke into storage bin and into coke buggies. The new be ches (which will have the latest improved furnaces) will be operated with l ss labor.

The Manufacture of Gas from Sewage Sludge.

[Communicated by "J. A. D.," Bristol, England.]

The problem of sewage disposal is one that has to be faced by every municipality, and, in keeping with the increase in importance of the community, the problem becomes more serious. Various means of disposal have been adopted in the past, ranging from the provision of a suitable outfall in a locality where the nuisance is not important; through various systems of land fertilization, septic tank systems; chemical and mechanical treatment, for the recovery of the fats and preparation of solid manure. A new interest has been given to the subject by a process which has been successfully adopted by the Municipality of Brunn, in Austria, by which the solid matter in the sewage is transformed into gas. After a great many experiments, an apparatus has beed devised by means of which the sewage matter is economically dried, and afterward distilled in retorts, in precisely the way that coal is treated, for the production of gas. It is necessary to have a powerful filtering apparatus of large output, and for this, Messrs. Abt & Bayer have constructed the continuous filtering machine, illustrated in the figures shown herewith, which are taken from a paper on the subject read by Mr. Leonce Fabre, before the Societe Technique de l'Industrie du Gaz en France. The machine consists of a cylindrical drum, the surface of which is formed of long filter cells parallel to the axis, the cells being so arranged that they dip into the tank or chamber containing the sewage mud. On the inside they are connected to a centrally situated chamber, common to all, in which a vacuum is produced, as described below. The hollow shaft supporting the system of cells forming the drum is arranged to permit of the rotating of the machine. One end of the shaft carries a pipe to the inside of the chamber, turning down into the central chamber, and immersed in the filtered liquid in its lowest portion. This pipe which is connected to a suction pump, assists the action of the filtering cells, and extracts a large amount of moisture from the filtered material as the drum revolves. In the other end of the shaft there is another tube, which carried compressed air to the inner surface of each cell in rotation, the point at which it is brought under the action of the compressed air being shown in the transverse section. The drum is rotated slowly, and each cell filled with the dried material, comes in turn to the point where the vacuum ceases, and passes under the influence of the compressed air, which, acting on the interior of the cell, dislodges the material from the filtering diaphragm in the cell being treated; and this solid material from the filtering process, after being thus partially dried, is taken away for the subsequent coking and gasifying process.

The water withdrawn by the suction pump is always clear; the necessary motive power is quite small, and the dried material is obtained in the form of cakes or plates 2 or 3 mm. thick, a convenien form for further drying. The drum has a useful filtering surface of 25 square mm. divided into 60 cells. The vacuum acts on 55 of these cells at a time, while the compressed air acts on a cell at a time. Experience has shown that the distillation of the damp material, when used without the addition of coal, does not give as good results, either from the point of view of the calorific power of the gas obtained or of the ammoniacal residue, etc., as when dry material is used. It is, therefore, necessary to dry the caked material obtained from the rotary filter, using any of the various well-known types of drier, before gasification in retorts similar to those used in ordinary gas making with coal. It has been found that, after 2½ hours of distillation, 100 k.g. of sewage mud yields 23.8 cubic k.m. of gas, of practically the same composition as that obtained from coal and the coke yield is of good quality and consistency; while as regards ammonia, three times as much is obtained as that usually yielded by an equal weight of coal. It is stated that, in addition to the value of the process in disposing of the sewage in a convenient and hygienic manner, the actual profit obtained from its operation has been found sufficient to pay for the gas for working the purification process. It is, therefore, an interesting development in modern sewage disposal practice, the future progress of which will be followed with interest by the authorities of many populous centers.

"W. E. G.," writing from Everett, Wash., under date of the 28th ult., says that Mr. H. H. Stephens, until recently, and since 1906, Manager of the El Reno (Okla.) Gas and Electric Company, has been appointed General Manager of the Everett Gas Company, operating in the cities of Everett, Snohomish and Monroe, Wash. Mr. Stevens is succeeded at El Reno by Mr. F. H. Tidnam, for several years in charge as General Manager of the Oklahoma Gas and Electric Company, Oklahoma City.

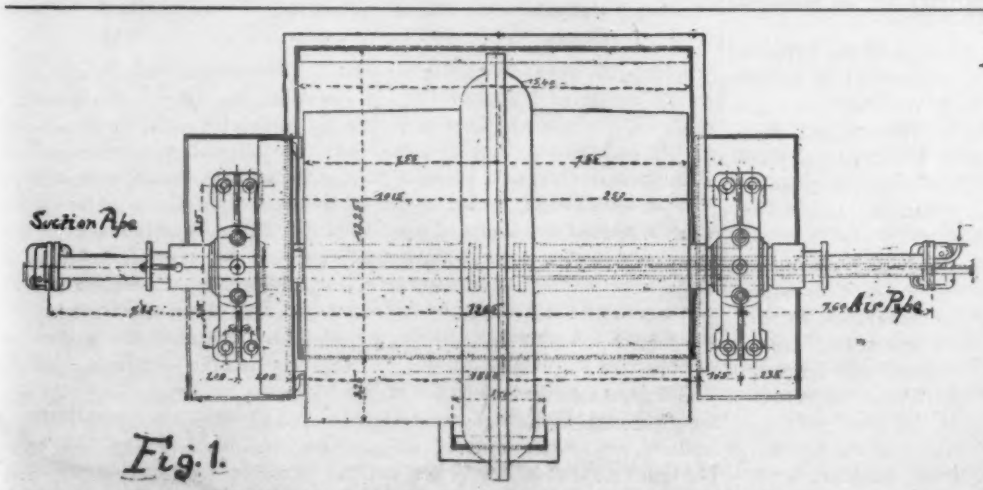


Fig. 1.

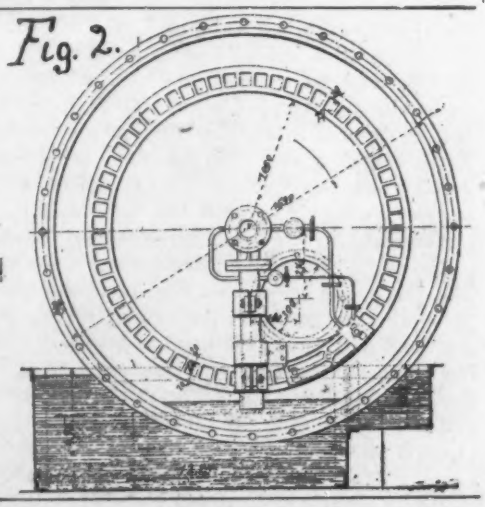


Fig. 2.

[Official Report.—Continued from Page 359.]

FORTY-THIRD MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 19 and 20.

Second Day—Morning Session.

The President announced that the first business in hand would be the reading of the paper by Mr. Charles H. Nettleton, President, New Haven (Conn.) Gas Light Company, entitled

SOME NOTES ON THE VERTICAL RETORTS AT DERBY, CONN.

I have been asked to present a statement of the results obtained from vertical retorts now being operated at the Derby gas works, Derby, Conn. During the past year a retort house has been constructed, containing a stack of 4 benches of 4 vertical retorts each, by the Isbell-Porter Company, under the Woodall-Duckham patents. Each retort is 24 feet 8 inches long, 30 inches by 20 inches at the bottom, and 24 inches by 9 inches at the top. The whole stack is supported by heavy iron work and the bottom of the stack is 13 feet above the lower floor of the building, which last is on the ground level. The size of the retort house is 66 feet long by 34 feet wide, and 68 feet 8 inches high to the peak of the roof, the stack running lengthwise of the house and approximately along the center line.

The coal is brought by a Brown hoist grab-bucket of 1 ton capacity, on an overhead monorail tramway from the coal storage, a short distance away. It is dropped into a pit outside of one end of the retort house, passed through a breaker and discharged from that into an endless chain-bucket conveyor, set vertically, which hoists the coal to the top of the retort house; from there it is discharged into a horizontal pushplate conveyor. Under this conveyor are located bunkers, and these are filled from openings in the pushplate conveyor trough; the bunkers have a capacity of about 36 hours. From the bunkers the coal drops into 16 small magazines about 18 inches square and 4 feet high, each connected permanently to the top of one retort. At the top of each of the magazines, and connected with them, is located a large plug cock or cylindrical valve, which is opened every ½ hour to fill the magazines with coal, and then closed, and the coal runs down into the retorts as fast as the coke is taken away from the bottom.

In the top of each retort is inserted vertically a cast iron plate, about 2 feet 6 inches long, running down into the retort, dividing the top of same into two compartments, one of which is connected with the magazine above referred to, and the other by a horizontal 6-inch pipe, to the foul main, which last extends the entire length of the stack. At the bottom of the retort is attached a large mouthpiece for holding coke, closed at the bottom with a self-sealing lid. Through the top of this mouthpiece passes a horizontal shaft with a series of teeth arranged in spiral lines for extracting the coke from the retorts. These shafts are caused to revolve, and in the test (to which I shall refer later) it was found that the average speed was 1 revolution in 82 minutes, with individual variation from 66 to 111 minutes. The speed of these extractors can be increased or decreased, or stopped, on any retort, without interfering with the extractor on any other retort; and it goes without saying that the faster the speed the more coke extracted, consequently the larger quantity of coal lets down into the retort, and, if the heat be kept up, the greater the quantity of gas produced. If the speed of the extractor be lessened, the opposite results are obtained.

The operation is continuous, and it would seem as if the labor of making coal gas were reduced to a minimum. The coal is hoisted by machinery, dropped into the retort by gravity, and the coke at the bottom dropped into a car running on tracks on the ground floor. After weighing, the car is run onto an elevator, hoisted to a track passing over the coke pile, and dumped. A little later it is proposed to erect a coke bin, so that the coke will run from the latter over screens into carts, and all handling will be saved.

Above the ground floor are several working floors and plalforms. The first above the ground floor is at the bottom of the generators, for clinkering the fires; the next at the top of the generators for filling them with coke; the third, a platform a little below the level of the foul main, for removing the pitch from the main and from the bridge pipes; then, a platform at the level of the top of the retorts; and the last a floor, at the level of the top of the coal breakers. There is an elevator in a brick shaft on the outside of the building running to all the floors. All the power used in the building is furnished by electric motors, 440 volts.

On the top floor, at the opposite end from the bucket elevator, is located a bunker, kept filled with coke by means of the car and elevator. This coke is drawn through a large pipe to the floor below, where it is used to fill retorts when first heated or after scurfing. There is also a second pipe through which coke is drawn to the second floor below to fill the producers; on this floor is a scale on which the coke going into each furnace is weighed.

The retort house (started August 20, 1912), has been in operation since. Through the fall, 3 out of 4 benches only have been running for the reason that, in heating up one of the benches, the fireclay material shrunk so much that the sectional retorts pulled apart, the upper section being held up by the covering over that particular bench, and this bench was in consequence partly rebuilt and has only lately been put in operation. For the 3 benches, the average yield was 75,000 to 80,000 feet per bench. This was a great disappointment to both the constructors and to the managers of the Derby Gas Company, as it had been expected that 120,000 feet per bench would be produced. Since the fourth bench has been started a record has been kept of the coal carbonized in this particular bench, and it has produced over 100,000 feet, on some days over 120,000 feet, assuming that the yield per pound from this bench was the same as that produced from all the coal carbonized. The way in which the quantity of coal was determined may be of interest. The coke from this particular bench was weighed separately from the other coke, and from this the quantity of coal carbonized in that particular bench was readily determined.

The gas, after leaving the retort house, is passed through primary condensers, exhauster, P. & A. extractor, secondary condensers, tar extractor and the standard washer, and then through a meter; all the apparatus except the meter has a capacity of 750,000 feet, and the gas actually made was about 225,000. The readings of the meter were corrected for temperature and barometer, and allowance made for the sulphureted hydrogen contained, which was removed later in the purifiers.

Recently, to determine the actual results obtained from this retort house, a test covering 8 days was made by Dr. A. P. Beardsley and Mr. E. C. Dunham, of the New Haven Gas Light Company, and Mr. W. O. Brewer, of the Meriden (Conn.) Gas Light Company. Tests were made in the daytime only. Covering the whole operation the results were: Yield, 5.42 cubic feet per pound. Candle power, 15.57, the gas being tested with a Sugg D-burner, with a chimney 6 inches high and 1¼ inches internal diameter, the standard used being a pentane lamp, which had been tested by the Bureau of Standards at Washington:

Candle feet, 84.4.
B.T.U., by a Junkers calorimeter, 615.
B.T.U., by analysis, 645.

The heating feet, obtained by multiplying the B.T.U. by the yield, 3,334.

The average of all the analyses gave:

Product.	Per Cent.
Benzol	0.55
Carbonic acid	1.49
Illuminants	3.98
Oxygen	0.28
Carbonic oxide	6.90
Hydrogen	45.02
Methane	37.33
Nitrogen	4.41

At a point about 7 feet higher than the top of the retort was set a water gauge and a recording gauge also to indicate the pressure upon the foul main. This was run as nearly as possible at a level gauge, or between that and one-tenth pressure. Allowing for the difference in elevation between that point and the mouthpieces at the bottom of the retort, where petcocks were inserted and a water gauge was connected by means of a rubber tube, and also allowing for the temperature of the gas in the retort, it would be possible to have, if there were no stoppage in the retort or bridge-pipe, a vacuum of 5-10 of an inch at the bottom of the retorts; on two occasions this vacuum was found. A summary of the pressure conditions at the bottom of the retort is as follows:

The greatest pressure found was 5.70 inches. The per cent. of all the observations showing a vacuum was 33.6. The average vacuum, .19 inch. The per cent of all the observations showing zero, 5.9. The per cent. of all the observations showing pressure, 60.5. The average pressure is .89 inches.

Dr. Beardsley offered the suggestion that, if the coke hopper at the bottom of the retorts could be connected, less gas would be lost from the retorts under pressure, and less combustion gas drawn into the retorts under vacuum. During the test there was produced:

Ammonia liquor, 5,212 gallons, containing, by analysis, 1,003 pounds of ammonia, a production 5.88 pounds per gross ton of coal.

Tar, 2,163 gallons, a production of 12.66 per ton of coal.

Pitch, 160 gallons, a production of .95 per ton of coal.

Referring to these in the order named. The Company is selling its ammonia as produced with a strength between 9 and 11 ounces, and is being paid for over 5.1 pounds per ton of coal. Dr. Beardsley says, in regard to the tar and pitch:

"The most noticeable points about the tar are: About 5.3 per cent. of free carbon; a high per cent. of tar acids; so little naphthaline that that portion of the distillate which contains most of it is liquid at ordinary room temperature. Also, that fraction of the distillate boiling from 310° to 330° C. shows (by the di-methyl sulphate test) paraffine hydrocarbons amounting to 7 or 8 per cent. A horizontal retort tar will commonly not show any such hydrocarbons. All these facts indicate that the tar has not been subjected to high heat, and would seem to show that the bulk of it, at least, has either distilled off from, or has come up through, the comparatively cool core of the coal.

"The pitch, which is hoed out from the hydraulic main is quite a different matter. It is very thick and heavy, and, when cold, will break or chip like ordinary coal tar pitch. It is not homogeneous, but seems to consist of semi-solid material mixed with heavy tar. When warmed a good deal of tar can be drained off. The residue when cold is very brittle. On the application of sufficient heat it fuses with foaming. It appeared possible that the residue might be largely coal dust carried over from the retort. Therefore, some of it was burned to an ash and found to contain .72 per cent. ash. This would indicate the presence of 9.6 per cent. of coal in this residue. The pitch, as drawn from the main, was mixed as well as possible by heating and stirring, and a determination made of the free carbon showed the amount was 27.19 per cent. It would seem, therefore, that this pitch is partly composed of coal dust, but is mainly the result of subjecting the tar vapors to destructive heat. It is suggested that it may have been formed from that portion of the tar which does not find its way into the comparatively cold center of the retort, but passes through the hot coke or along the walls."

The analysis of the coal was as follows:

	Per Cent.
Moisture	1.44
Volatile combustible	34.60
Fixed carbon	56.41
Ash	7.55
	100.00
Sulphur	.94

To obtain lhe sample of coal, each day four shovelfuls were taken from each bunker, and at the end of the test the accumulated samples were crushed to pass a ¼-inch screen and quartered down to the laboratory sample. The analyses of the coke:

Content.	Per Cent.
Moisture	0.00
Volatile combustible	2.40
Fixed carbon	84.75
Ash	12.84
	100.00
Sulphur	0.74

To obtain this sample a shovelful was taken daily from each retort as it was discharged. The accumulated sample was crushed and screened as in the case of the coal. For the 8 days covering the test the coke produced amounted to 68.57 per cent. of the coal charged. This is a large figure, the cause of it may be the following: A part of the tar produced in the retort condenses on the coal and is redistilled, leaving as a residue a considerable proportion as coke.

A very peculiar thing connected wtth the operation of these benches is this: The coke drops from the mouthpiece black (that is, not incandescent). The writer has never yet seen any coke on fire coming from the retorts, yet being so hot that it cannot be held comfortably in the hand; but it is grey or black. I have been told that two or three times some coke on fire dropped out, and a little water had to be used; but it has been so infrequent the statement can fairly be made that it comes out practically at all times black. This leaves the coke perfectly dry; but there is a slight disadvantage in this respect, that, when dropping the coke from the retorts, considerable dust arises, and also when dropped on the coke pile in the yard. A considerable quantity was forked over to separate the large coke, and the residue passed over a ½-inch screen to separate it into fine coke and dust. The following percentages were obtained:

Sizes.	By Weight. Per Cent.	By Measure. Per Cent.	Weight per Bushel. Lbs.
Large coke	90.96	93.70	29.86
Fine coke	3.74	3.06	37.64
Dust	5.30	3.24	50.26
	100.00	100.00	

For the 8 days the quantity of coke used to heat the retorts was 26.04 per cent. of the coke produced, or 17.86 pounds of coke to carbonize 100 pounds of coal. This disappointing showing it was believed came from two causes, The producers were made larger than was necessary, and the retorts were so thoroughly protected by tile, following a plan that had been used in Europe successfully, that it took more coke than it should to produce the heat desired inside of the retorts. On the bench that was rebuilt a good deal of this protecting material around the retorts was removed, and the producers made somewhat smaller, with the result as stated before, that the yield of the bench has been materially increased, and the consumption of coke has been reduced from 26 per cent. to about 20 per cent., or from 17.86 to about 13.6 pounds of coke to carbonize 100 pounds of coal.

Under the producers are rocking grates. These remove the larger part of the ashes, and the fires are clinkered only once in 48 hours. For 3 months no supplemental bars have been driven, except on one occasion, and the clinkering consists of using a poker and pushing that back over the grates and stirring up the fire. The ashes drop into chutes with self-sealing lids, and from these are drawn out once a day into barrows. These ashes are very fine and very dry, as no water is used, and, when drawn under present conditions, produce a large quantity of dust. The temperatures were taken by a Wanner pyrometer, and in this connection Dr. Beardsley reports as follows:

"At the top of the combustion chamber, each bench, at the front, is fitted with 4 ports through which the heats may be observed; and also with 4 ports at the back of the stack, 5 feet 3 inches above the bottom of the retorts. Four times daily readings were taken at each of the top ports—the hottest points in the bench. The average temperature for 8 days was 2,228° F. Though fairly constant conditions were the rule, the heats were subject to considerable variation. They are not the same at the 4 ports of a single bench, particularly in the end benches. Individual heats can rise 300° in 3 hours, and the average heat of all 3 benches once rose 120° in a little over 2 hours. Attention is necessary to prevent the rapid development of local excessive heat. This is perhaps due to the large capacity of the producers, which permits a rapid increase in the amount of producer gas made. The lowest heat recorded was 1,901°, the highest 2,507°. Occasional sets of readings were taken also at the bottom of the combustion chamber, and at the stack just above the dampers;" and the results are as follows:

Average temperature at bottom of combustion chamber, in back, 2,067° F. Average at stack, 1,110° F.

Recently tests have been made as to the power required to operate the coke extractors and the shaking grates, and, as near as can be determined, it amounts to 6/10 of a horse power.

On the outlet flue from one of the benches an upright tubular boiler, 3 feet diameter, 8 feet high, has been introduced, all the waste heat from one bench passing through same. The steam from the boiler runs a duplex Worthington pump, 6 by 4 by 6, pumping weak ammonia liquor to the far end of the foul main. The exhaust steam from this pump, supplemented by a little additional steam from the works' boiler, goes under the grate bars to prevent the formation of clinker.

The pitch is cleaned out of the foul main and bridge pipes twice in 24 hours, and generally is the most unpleasant and trying work the men have to do. Some of the time the pitch is very difficult to remove. While they meet with no gas in cleaning the main, owing to a partition dipping below the level of the water, in cleaning the bridge pipes the gas comes out in considerable quantity, making the work much harder than it otherwise would be.

As to the labor, it is hard to judge from a house the size of that in Derby what it would be in a larger plant. So far we have had 3 men and a foreman on each shift, and apparently there was very little difference whether 3 or 4 benches were run. Two men take care of

the coke, fill the producers, clinker the fires, and clean the pitch out from the main and bridge pipes; the third man is on the top of the retorts supplying the coal to the magazines regularly, and running a bar down into the retorts frequently to prevent "bridging" of the coal.

With 4 benches making 100,000 feet each in 24 hours, the make per man would be 50,000. It has seemed to the writer that the same men could take care of a fifth, perhaps a sixth, bench, in which case the make per man would be increased to 62,500, or possibly to 75,000 feet. This labor stated above does not bring in the coal, but does take the coke into the yard; also the ashes. It is perhaps fair to add that since the test stopped the results in yield and candle power have not been so good as during the test; but for the month of January the average yield was 5.31; C. P. 15.63; candle feet, 83. We do at times obtain very much better results, frequently approaching 90 candle feet, and have a few times exceeded that point. Whether some careful operator will show a way by which the candle feet can be kept above that point all the time I do not know; but it does not seem an impossibility.

Speaking broadly, the vertical retorts at Derby may be said to be a success. I say this without any reference to myself, as others are very largely responsible for whatever results have been attained. The main features to my mind are admirable, in that so much of the work is done by simple, inexpensive machinery, not liable to get out of order frequently, and not needing expensive repairs; and, also, that so much of the work is done by gravity. On the other hand, various details have not been worked out satisfactorily; as, for instance, the quality of the fireclay used in both retorts and settings, and the form of the setting itself. The fireclay material used at Derby unfortunately shrunk not less than 3 inches in the length of each retort. I firmly believe, however, that these difficulties will be overcome, and it is only fair to say that apparently they have already been overcome in England.

Given a retort house where the daily make is 500,000 cubic feet or more, and after the details of the construction of the benches have been successfully worked out, I am inclined to think that more gas of an average quality can be made, for a given outlay for labor and repairs to machinery, than by any other method with which the writer is familiar. Whether the high candle feet results produced by some of our friends with horizontal retorts can be reached is a question yet to be determined.

[To that statement I might add the following: For October, candle feet, 81.01; November, 78.79; December, 85.7; January, 83.[1]]

Discussion.

The President—We are fortunate in having the designer of this system with us to-day. I will call on Mr. Duckham.

Mr. Duckham—Mr. President, I thank you for your kind invitation to be present and to hear Mr, Nettleton's paper. I have visited Derby and greatly appreciated the way the setting was built and the results obtained. The construction has points which I considered superior to our English practice. Referring to Mr. Nettleton's paper, there are one or two points which I should like to raise. I think the variation in the speeds of the extractor gears are excessive. In regular working a larger variation than 2½ per cent. will not be noticed, except when the gear is altered purposely. In England we work at a speed of about 1 revolution in 58 minutes. I note they have had trouble with the firebrick, as has also been the case with us. Had we been able to obtain suitable fireclay from the start we would have been in our present position several years earlier. The yield per bench is low, which is undoubtedly due to the excessive shielding of the retorts and the low conductivity of the material. In England the through put of the retort varies, from 18 tons per setting of 4 retorts per 24 hours, with Durham coal, to 20 tons of Yorkshire, 22 tons of Derbyshire, to 24 tons of Scotch coal. The question of firebrick material is a most important one for all coal gas makers. In England we have tackled this problem and have greatly improved the quality of the bricks produced. I am sure that a committee of gas engineers and fireclay makers would better the quality of material on this side. The candle power seems to be low at Derby, when the composition of the gas and the high calorific value are taken into account, and I would suggest that the various types of high and low D. and F. burners be tried to get a more efficient effect. The quality of the gas is wonderful. In England we do not make gas of such composition from straight coal. The methane figure is high and most valuable. The bottom pressure results are interesting, and the variation was due to somewhat uneven working. On the large retorts used in England we never get any pressure; in fact, under all practical conditions, the pressure is about 1/10 inch less at the bottom than at the top of the retort. The presence of paraffine hydrocarbons in the tar shows that the gases leaving the retort have not been subjected to a sufficient amount of heat. We have now a sliding plate in the retort by which we can regulate exactly the amount of free space that the gases have to pass in leaving. Mr. Nettleton mentions pitch troubles; but I think all vertical retort constructions have wallowed in pitch at one time or all other. I am glad to say we have eliminated this trouble in England, and am sure you will do the same here. The percentage of volatile matter in the coke seems high, and the quantity of coke used for fuel is also high. In England, from tests by outside engineers, we have obtained figures of 11 to 11½ per cent., and we hope to get still lower. This figure is not through deduction, but is actual coke weighed, no allowance being made for ashes and moisture and steamed coke. I am surprised at the uneven temperatures. We have no trouble in England in keeping these quite constant. Labor on all systems has been greatly reduced, but the 150,000 cubic feet per man, working 8-hour shifts, is a figure for a 5,000,000-foot plant, as low as is obtainable with ordinary producers. I heartily congratulate Mr. Nettleton on the simplicity of his statements. I am sure, when his plant has settled down and is in ordinary work, the reported results will be exceeded, and in the latest showing even more satisfactory.

The President—To get through with our programme this morning we will allow about 5 minutes for special questions to Mr. Nettleton before going to the next paper.

Mr. Taussig—I think Mr. Nettleton has made a very, very frank statement to us of his operating results, and I would like to commend him for it. We seldom get at our gas meetings a paper in which practice is told so frankly, and I believe that it is of great value to have results given as accurately and as frankly as these have been. He gives results for 8 days, in which observations were only taken in the daytime. I believe that those results are probably an average of what would be obtained through the 24 hours, but it does leave a question as to whether the results are accurate if only taken during a portion of the period.

Dr. Elliott—Some five years ago I first saw the work of vertical retorts in Europe, and it seemed to me a step in the right direction, but I have heard some comments here that make me doubt this sometimes. However, the more I think of it, the more I am satisfied that it is the right direction, to have vertical retorts. Mr. Nettleton gives in one place an analysis of coal containing 7.55 per cent. of ash, but he says further on that the coal yielded 68.57 per cent. of coke. If the coal lost that amount of material his coke should only contain 11 per cent. of ash, but it contains 12.84 per cent. I don't see where he got the rest of the ash. I am talking as a chemist, and we have to make analyses that foot up, and this does not tally as closely as it should. He says also that the tar contains very little free carbon. That would go to show that the tar has not been submitted to the usual heat, because that would give more carbon and naphthaline. We hear a lot of scare talk about naphthaline. It is bad when you get a a lot of it; but some of it is a pretty good illuminant, and, if you can only take care of it in the works and not let it go out in the street mains you are all right. It seems to me that these results are not quite high enough in naphthaline for good candle power. I agree with Mr. Duckham that we must look out that we do not have paraffine there. It might be a good thing for the tar manufacturers with which to make pitch, but they don't seem to know how to handle it. Take, for example, the water gas tar; they have always been fighting this, but they are beginning to understand that water gas tar, if one knows how to handle it, is better than coal tar, because it contains, less carbon. I also wish to compliment Mr. Nettleton on his splendid exposition of a piece of experimental work that is worthy of being copied by all. We want to know about these things; we want to get together and talk about them, and remember it is no longer a question of secret process. In fact, we want to do the best we can for everybody. That is what this New England Association means; we want to come together to tell one another the truth about things, and we will get along better, and everybody will make progress. Then, the dear public will not be hurling their anathemas against us. We know what we are doing, and we have to tell people what we are doing, so that we may be worthy of our hire. I figured the other day on what we are we are giving for gas per candle in New York and what we ought to get, figured on an English or Continental basis. We are selling gas for 80 cents in New York, and we should get a

1. Subsequently added by the author.—Ed.

dollar for it. Mr. Nettleton's paper is the sort of work which will bring that out and give us the best results for our engineers, chemists, and the people combined.

Mr. Nettleton—I would like to say to Dr. Elliott that we knew there ought to be 11 + per cent. of ash, but we found 12 + per cent., and simply stated the facts as they were. Before saying anything else, I would like to have Dr. Beardsley make some statement in regard to this ash matter.

Dr. Beardsley—We also thought this very strange. Previous to the 8-day test we made 5 analyses of the coke, and the average came out 12.55 as against 12.84, in this present case, so that the latter value evidently is regular. I have two possible explanations to offer for it: First, in the grinding down of the coke, it may cut a certain amount of iron off the grinding tools. The sample was crushed with tamping irons on a concrete floor, and the sample was further crushed in a ball mill. We tested it and found increased iron content, but apparently not sufficient to account for this great difference in the ash. Second: The conditions in the vertical retort are different from those in the horizontal types, and we many imagine that sulphide of lime and magnesia are formed in the process, so when the coke containing that sulphide is burned to ash it is possible that the sulphide may oxidize to sulphate, with a very considerable increase in the weight of the ash as a result. Those two possibilities, the increase of iron and the production of sulphate, are the only ways in which I can account for the high ash, and we found it in every case.

Mr. Nettleton—Replying to Mr. Taussig, the reason the test was not carried through the 24 hours was the additional expense involved. I felt it would be fair, running over a period of 8 days, to take the results obtained in the daytime, assuming that no attempt was made to interfere or change the running at night, as I am sure there was not. I believe these results are practically the same as would have been obtained, if the test had been run through the whole 24 hours. As to the naphthaline produced: While there was naphthaline in the gas, as was shown by the picric acid test, the quantity is so small that it has not given us any trouble around the works or on the street. The condensing apparatus has been run without any regard to the possibility of naphthaline deposits, and, as far as I know, no naphthaline has been seen since the verticals have been started. There is a very sharp contrast between the working at Derby and the working at New Haven in this respect.

The President—We have a gentleman here who has come a long distance and very kindly consented to read a paper for the Association. We are very fortunate in getting Mr. R. B. Brown, of Milwaukee, Wis., to read a paper entitled,

COAL GAS? SURELY. BUT HOW?

Your President asked me to prepare for this meeting a paper on the carbonization of coal, bringing the comparison of processes, results obtained, etc., up to date. With the difficulties that exist in the way of making any definite comparisons of results, due to different bases on which reports from the various installations have been made, and to the fact that, therefore, figures given are not comparable, and to the further fact that no single set of figures bearing on particular processes or plants can be entirely trusted to show up all the features, both good and bad, of a process or of an installation, I did not feel willing to undertake any such difficult, unsatisfactory and thankless task; and, therefore, have only agreed to jot down a few impressions of the systems of carbonization which are now most prominent before the gas engineers of this country, with the hope, perhaps, of bringing out in the subsequent discussion more facts, more comparisons, and more opinions of value than have been published or made public so far, and perhaps further of being of some slight assistance to those of my fellows who have that difficult problem before them of deciding what to build.

I want to say here that if we had had more reports, such as Mr. Nettleton has given us, of an honest effort to find out what a plant was doing, it might have been possible, though with considerable work, to have given the comparisons that Mr. Barnum asked me to try to give: and if Mr. Nettleton, in 4 or 5 years, will give us a further analysis of his first cost, his maintenance and repairs, I think we will know, or at least I will know, a whole lot more about this subject than I do to-day. Mr. Duckham's statements have also been very illuminating, at least to me. I didn't know as much about it before as I do now, and some of the things I may say hereafter in this paper might have been changed if had I heard this discussion before. [Applause.]

The destructive distillation of coal, as a means of separating the volatile constituents from the fixed carbon for the utilization of the oils and tars, for the recovery and use of the gas, to obtain the resulting coke, and for various combinations of these requirements, has been carried on for over 100 years. The methods employed for each requirement have not varied very greatly, however, for a number of years past. The treatment of the coal, particularly when considered with reference to the production of gas, is often, even to-day, of the crudest possible description. Our knowledge of the proper treatment of the delicate hydrocarbons evolved during the process of distillation is not what it should be, and yet we know much more about what should be done in our handling and heat treatment of these hydrocarbon vapors than would appear from the actual processes as practiced in our various systems of carbonization.

The manufacture of coal gas on a large scale in recent years has been reduced to a point where there are really only a few places where very great cost savings may be made. The large items in the cost of manufacture are divided between the cost of handling the coal and coke, which is now universally done by machinery, the cost of direct carbonization, and cost of the material used. The carbonization labor can be, and has been, reduced in every process, at the expense of increased capital costs, and in most of them at an increase in maintenance and depreciation of plant. In some cases the saving in labor has not been sufficient to justify the increases in fixed charges. However, while first cost is an important item, I would not have you forget that the return on that cost through reduction in labor and increase in profits, and, last but not least, through reduction of maintenance, *may* wholly justify the investment. The problem which confronts us in the obtaining of sufficient skilled labor to operate some of the older-type retort houses, and which may confront us in the future in the handling of newer types of houses, in which the actual effect upon the labor has not been as fully considered as it might be, will have more to do with the future of processes and methods than the dollars-and-cents cost might appear to show.

You New England men are peculiarly favored in that, in making your comparisons of processes and plant, you do not have to go outside of your own bailiwick for working examples of nearly every form of carbonization plant and process now entering into the problem. You have in operation the older-type retort houses in every stage, from handwork to the adoption of machinery as of 8 or 10 years ago; you have some good examples of inclines of the type that created so much interest both abroad and in this country some 8 or 10 years ago; you have installations of horizontal throughs that were built during the last decade, equipped with what, at the time, was considered the latest and best of machinery; you have installations showing the last word in vertical equipment 3 years ago; your oven installations are not quite as near up-to-date as some that have been built and are being built to-day; but their good and bad points are probably well enough known to you to keep up your interest in that process of carbonization, and to insure that you would give it its full measure of consideration in any study or comparison that you are about to make; you have a recent American-built plant of the continuous vertical type; and, finally, you have had fired within a few months the latest word in horizontal throughs, with perhaps the most highly developed machinery installation that the world has ever seen. For everyone of these types of carbonizing plant good things can be said and truly; it is probably just as true that with every one of them we may find fault, and it is indeed a difficult matter to balance the good and bad points, keeping in mind at all times those additions to fixed charges which most inevitably follow reduction of labor. I believe that the most important items to be considered as far as these changes are concerned, must be, first: The treatment of labor—that is, as to what endurance of hardships and severity of manual labor we may reasonably expect of the men employed in these plants in the future; next, the utilization to the utmost of all the available value in the raw material, which in this case is coal. We know that the visible supply of satisfactory coal for the manufacture of gas is not increasing, but the cost of mining it must inevitably increase, that the reasonable return to the owners of the coal land has not been paid in many cases in the past, and, therefore, probably will increase in the future; and, again, we must take into account the general and far-reaching effect of the education of the public upon lines of conservation of natural resources. Everything points to the one end. We must conserve every B.T.U. of energy that can be taken from the coal and every cent's worth of value in the residuals.

It will, perhaps, be in order now to attempt to give you a few of

(*Continued on page* 374,)

THE AMERICAN GAS LIGHT JOURNAL

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

A. M. CALLENDER & CO., - - Proprietors.

THOMAS J. CUNNINGHAM, ELBERT P. CALLENDER, } Editors.
SANFORD K. CAMPBELL, Associate.

CHARLES H. WADELTON, Manager.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, JUNE 9, 1913.

BRIEFLY TOLD.

MAY MEETING, PHILADELPHIA GAS WORKS SECTION, N. C. G. A.—The May meeting of the named body was held the evening of Thursday, the 29th ult., in the handsome Auditorium of the Y. M. C. A. building, 1421 Arch street, with President Thomas R. Elcock directing the proceedings. Routine business having been completed, the remainder of the evening was satisfactorily taken up through the medium of a series of debates. The resolution "That the placing of outside gas arc lamps on a rental and free maintenance basis would be beneficial to the Philadelphia Gas Works," was argued by two teams of three members each. The affirmative team (Messrs. Thos. Carney, Manager of the burner maintenance division, and J. C. Smith and F. O'Donnell, of the sales' section) was captained by the first-named; the negative team (Messrs. H. L. Wynne, of the storeroom, and C. O. Duval and D. M. Thornton, also of the sales' section) was captained by Mr. Wynne. The affirmatives opened the debate, each member of the opposing team alternating in 8-minute discussions, with a rebuttal of 10 minutes on the part of the opposing captains. The arguments offered and set forth were excellent in detail and marked by originality. In fact, so evenly were the arguments of the respectiye teams matched, that the Board of Judges (Messrs. W. J. Serrill, J. B. Douglas and H. S. Battin) had a lengthy deliberation before a decision in favor of the affirmatives was eventually reached. Mr. Serrill, in voicing the verdict, spoke of the Judges' perplexity in arriving at an understanding, which hesitation was largely due to the capable, forceful rebuttal submitted by Mr. Wynne. During the interim, from the closing of the debate to the rendering of the decision, the question was put before the house for general discussion from the floor. The meeting was decidedly of the instructive sort, and proved conclusively the positive value of this type of proceeding as a way to arouse and stimulate discussion. For our report of this interesting meeting we are largely indebted to the attention of Mr. Morton G. Neff.

FOURTH ANNUAL GOLF TOURNAMENT, GAS AND ELECTRIC COMPANIES, NEW YORK CITY.—Other outdoor functions of a kindred nature may have resulted in more genuine sport and in a "happier time" generally than those which happened from the "Fourth Annual Golf Tournament of the Gas and Electric Companies of New York City;" but the writer fails to recall any such, and his present record in connection therewith is many, also lengthy. To begin with, the beautiful links of the Oakland Golf Club, Bay Side, Long Island, was the scene of the main fray; and never better did the Club's handsome and satisfactory belongings look than as "they looked" the afternoon of May 28th. Not far from 100 shared in the joys of the day, and these included the chiefs, the under-chiefs, the near chiefs, and the rank and-file, from President George B. Cortelyou, Chief Bradley, Manager Carter, "Super." McLean, "the only scorekeeper," Fogg, the alert works' men, Morris, Atwood, *et al.*, and the inimitable Cross, the only misnomer about whom is his name. However, were I to keep on "naming" space would speedily be nil. Wherefore let me say that, on the day in question many lambs gambolled on the green, and gambolled "much and plenty." The choice event of the programme (the President's Cup, presented by Mr. Cortelyou) went to that justly renowned athlete, Mr. H. B. McLean, the runner-up being Mr. A. W. Stark. To become the real property of any aspirant this cup must be won twice by such aspirant; and (while, of course, there's really nothing in it) some remarked that it would surely become the property of Mr. McLean, if O. H. should do the scorekeeping in 1914! Perish the insinuation!! The next prize (36-hole, gross score) went to "Jim." T. Lynn's friend, Mr. George E. Woods, the runner-up being Mr. J. M. Butler. Many "rooters" were sounding for the runner-up; but by a mighty effort Mr. Woods put to flight the bogey man. The third certificate was issued to Mr. John Stillwell. It represented victory in the 18-hole handicap, the first 18 holes to be the test. Mr. W. Cullen Morris (the runner-up) having often been *particeps criminis* with the scorekeeper, dared not "kick" (let alone contest) the count. No one ventured the thought that Fogg was at all misty in his count respecting the 18-hole, novice class. The prize went to Mr. C. J. Gefvert. The winner of prize for the best selected 18 holes, after a splendid contest, went to Mr. W. W. Freeman, with Mr. H. L. Snyder as second-best. Poor Snyder; how hard he tried. Nor did Fogg help him out in the least. By some untoward, misunderstandable happening the "Kickers' Handicap," after much puzzling through the maze of 18 holes, was awarded to "Charlie" Boone. Whatever he did to merit this winning must eventually be determined by the gentlemen who reside in that quiet Brooklyn section, bounded by Cross and Kent. It simplified matters greatly for the scorekeeper, in that he was forbidden by the rules from seeing to it that no one contestant could be awarded more than a single prize, no matter how many times he "started." It might be narrated of Boone that 'tis possible he secured the "kickers' prize" because he urged once or twice that the "tee should be choked into the Caddie." However, it was surely with washed bodies and rancorous rumblings that the dinner hour was greeted. "Oh! how those golfers yelled, when they heard the dinner bell!" And such a dinner; cooked to perfection, served to the nines and absorbed to the end. 'Tis a long hark from the "wine and walnuts" of over a week ago; but no mistake is made when I say that it was an old-fashioned, fraternal feast which will long be remembered by those who shared in it. The proceedings were under the direction of that prince of men and most lenient of toastmasters, Mr. W. J. Clark, and the speakers of the evening were: Hon. George B. Cortelyou, whose voice is as valiant and whose method is as suave, as in the days when, from the Nation's Capital, his utterances commanded the attention of the world; the Hon. Morgan J. O'Brien, whom his State loves to honor; Mr. N. F. Brady, potent and prominent in the financial and industrial world; and Mr. Patrick Francis Murphy, whose eloquence needs no elaborating from my pen. The officers of the Association in 1913 are: President, H. M. Edwards; Secretary and Treasurer, H. B. McLean; Official Scorekeeper, O. H. Fogg. Those named for 1914 are: President, G. W. Doane; Secretary and Treasurer, H. B. McLean; Official Scorekeeper, O. H. Fogg; Executive Committee, Messrs. N. F. Brady, H. L. Snyder and M. H. Graham. This account would be altogether incomplete if due credit were not given to Secretary McLean for his persistent and successful service in the above connection.

MR. NETTLETON'S STATEMENT RESPECTING CARBONIZATION PRACTICE AT DERBY, CONN.—As was common comment in discussion, the distinguishing feature of Mr. Nettleton's paper on the vertical retorts at Derby, was his absolute candor. That such an attitude is to be commended, is proof of its veracity. We are much more likely to publish our good results only, and forget our shortcomings, than to say as did Mr. Nettleton, we got but so and so, and know it should be better. Neither does he place all the blame on the design and construction of the benches, but says, "perhaps some careful operator will show a way * * *." The Derby plant seems to be an improvement on the general English practice with similar retorts, and its importance to gas engineers as an example of modern develop-

ment is attested by the interest and discussion aroused by this very illuminating description of it and its results.

MR. BARNES TO REPRESENT MESSRS. BAYLEY & SONS.—Mr. Will. W. Barnes, for many years well and favorably known to the fraternity, has been admitted to the firm of Bayley & Sons, makers of lighting fixtures, with works at 105-9 Vanderveer street, Brooklyn, N. Y., and offices in the Architects' Building, New York city. Mr. George W. Bayley, the head of the firm, has had 25 years' experience as a fixture manufacturer, and is largely responsible for the development of white metal, in fixture work, and the production of "Equalite" glassware; this last product being the distinguishing feature of the very successful line of semi-indirect lighting appliances, now made by this firm. Mr. Barnes has a large acquaintance among gas men, and his friends have no doubt of his success in this new connection.

CURRENT MENTION—

GAS properties in this city seem to be particularly attractive to our municipal authorities. Only a few years ago the 18th street plant of the Consolidated Gas Company, of New York, formerly the West Station of the Manhattan Gas Company, on the North river, was acquired by condemnation proceedings for the "Chelsea Improvement" of the water front; and now similar proceedings are about to be instituted to acquire the West 44th street plant, formerly the Municipal Gas Company, for the purpose of constructing the projected 1,000-foot piers, to accommodate the large steamers now building. We understand that Mr. H. de B. Parsons has again been retained by the city as an expert in connection with the valuation of the property, and that Messrs. Alten S. Miller and W. W. Randolph have been retained by the Consolidated Gas Company to act on its behalf.

MR. V. L. ELBERT has assumed the duties of Manager of the St. Joseph (Mo.) Gas Company, vice the late Mr. Kerr Murray Mitchell, and prior to taking leave of his former associates in the St. Paul (Minn.) Gas Light Company, he was certainly surprised over the way in which his men bade him God speed. Perhaps we will be able to narrate the happenings in full in "our next."

THE Norwich (Conn.) Gas and Electrical Commission has appointed Mr. Stephen J. Kehoe, Superintendent of the Norwich & Westerly Traction Company, to the position of Superintendent of the Norwich municipal gas and electric lighting plants. Mr. Kehoe succeeds Mr. W. F. Bogue, whose resignation was formerly noted in the JOURNAL.

MR. EDWARD WHITMAN, Superintendent, Street Department, Board of Public Works, New Britain, Conn., has been chosen by the New Britain Gas Light Company to succeed the late Mr. Louis Galpin, as inspector and general overseer of the Company's distributing division.

THE gas output for May by the Boston Consolidated Gas Company showed a gain of 4.4 per cent., as compared with the corresponding period in 1912. The gain on like account for April was 2.96 per cent.

THE lower branch of the Connecticut General Assembly has passed the amendment to the charter of the New Haven Gas Light Company, under which that corporation is permitted to increase its capital to $10,000,000. Its present limitation is $5,000,000.

THE proprietors of the Ottawa (Canada) Light, Heat and Power Company have determined to issue $800,000 additional capital, which emission will bring the total capitalization to $2,800,000. The proceeds are to be used in the construction of a new and modern gas plant in East Ottawa. The shares are to be issued at par to shareholders of record, the 20th inst., and the rights are of positive value, in that the current market quotation for the old stock is 160 to 165.

MR. J. ALEX. MAYERS, President of the Public Service Construction Company, writing from San Juan, Porto Rico, under date of May 28th, says: "We have completed the foundations for the half million capacity holder, and are busy generally on the other buildings, foundations, etc." He also sends his regards to all inquiring friends; concluding with the remark, "I wish you all were here enjoying weather that is absolutely ideal!"

"RUTGER," writing from Lincoln, Ills., under date of the 31st ult., incloses this: "The City of Lincoln Gas Company has completed its reorganization matters, and will hereafter be known as the Logan County Gas Compsny. Several betterments have been made upon the plant, a new storage holder and quite an addition to the generating division having been constructed. The new business section of the corporation has been put on a hustling basis, with the result that 100 or more consumers have been put upon the lines, and scores of ranges, hot water devices, high power lamps and the like have been put in the houses and shops of this thriving community. The control in the Company is held by Mr. M. C. Gorgas, of Philadelphia, and he certainly is a modern business man, of the type who readily sees that good service to the community means fair profit to his associates and himself. The main system will likely be largely added to this fall, for there are one or two existing and growing settlements that will be piped up, if not this summer or fall, certainly in 1914. Mr. C. Everett Smith is the Company's Attorney."

MR. CHARLES EDWARD CLARK, City Treasurer of Derby, Conn., Cashier of the Birmingham (Conn.) National Bank since 1878, and Vice-President of the Derby Gas Company, died the last Sunday in May, after a short illness. He was in his 64th year, having been born in Derby, July 26th, 1849.

MR. VICTOR P. DEWEY, since 1911, Vice-President, General Manager, and a member of the Board of Directors of the Grand Rapids (Mich.) Gas Light Company, has been chosen General Manager of the Detroit City Gas Company. He succeeds Mr. Irvin Butterworth, who was obliged through illness to resign. Mr. Butterworth, who will travel in Europe for a time, still continues as Vice-President of the Company.

Correspondence.

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Some Production Figures, from Hull, England.

MANCHESTER, ENGLAND, May 22, 1913.

To the Editors, AMERICAN GAS LIGHT JOURNAL: In a paper recently read before an English scientific society, the author discloses the products obtained from "verticals" of the Dessau type, in operation at the Hull gas works. In this case the retorts receive a definite charge of coal, at intermittent intervals of 12 hours, and the figures given relate to a working period extending over 27 weeks. The results appertain to a system which, originating in Germany, has been adopted only to a comparatively small extent in England, where the idea of continuously supplying coal and withdrawing coke seems to find greater favor. The experience at Hull certainly appears in a measure favorable to the Dessau system, for the retorts are credited with a gas make of 14,150 cubic feet from each ton (gross) of coal, although the illuminating power of the gas produced is practically 15 candles. It is noticed, however, that the net calorific power is somewhat low, being 500 B.T.U., against an average figure of about 550 B.T.U. for "horizontal" gas. This result undoubtedly is the outcome of a system of "steaming the charge in the retort whereby a certain bulk of water gas of low heating power is generated. A test, of course, would be of little comparative value, unless the type of coal used is stated; and in this case the figures were perhaps favored by the use of an excellent gas-making coal; namely, Yorkshire (England) Silkstone.

Yours truly, I. N. COWE.

It Should Have Been Ten, Not One.

NEW YORK CITY, May 29, 1913.

To the Editors, AMERICAN GAS LIGHT JOURNAL: In the JOURNAL for May 26th is a paper, by Mr. T. B. Genay, that was read at the Ninth Annual Meeting of the Iowa District Gas Association. About the middle of first column, page 336, there is an error, which may be a typographical one, but nevertheless one which I think it well to correct. It reads, "The temperature of the feed water plays an important part in the performance of the boiler, a rise of 100° in the feed water temperature meaning approximately a gain of 1 per cent. in boiler efficiency." From "Kent's Handbook" we note that, "An approximate rule for the conditions of ordinary practice is a saving of 1 per cent. is made to each increase of 11° in the temperature of the feed water. This corresponds to .0909 per cent. per degree. It is obvious that there is some error. Sincerely yours,

CHARLES H. HODGES.

[The error is surely an obvious one. All authorities on steam and steaming in boilers (Kent, Barr, etc.) declare that a rise of 100° in feed water temperature means approximately a gain of 10 per cent. in boiler efficiency.—EDS.]

Book Reviews.

Silica Retorts and Settings.—The Bulletin on this subject, just issued by the Improved Equipment Company, of New York, and bearing the title in the heading, is an interesting description of the production of refractories used in gas bench construction. Although dealing principally with the construction of the Doherty Economizer benches, it embodies a lot of valuable information on fireclay and silica, including the general behavior under high heats, the relative fusing points, and their adaptability to gas works requirements. Engineers will find much of interest between its covers.

(*Continued from page* 371.)

the significant features of the several processes above enumerated as they appeal to me.

Of the old-type horizontal houses, operated by manual labor, nothing need be said, except I feel sure that none of you would consider the installation of such a plant to-day, and that you feel that it is proper to replace such installations as increased requirements give opportunity.

To inclines I paid my respects some years ago, and I have not in practice and in the study of results obtained by others had occasion to change my views since. While a great improvement over some of the other plant which was being used and built at the time they were at the height of their popularity, I do not feel that they justify the cost of building in any particular; they do not fulfill the requirements of proper treatment of the gas in the process of carbonization, they do not improve labor conditions for the men, their maintenance is very high compared to the amount of gas made, and while a serviceable and practical plant, it is not one that we will hear very much of in the way of new construction in the future.

The intermittent vertical installations, as far as I have been able to learn, have, in their present type of construction, developed several difficulties, some of which are inherent in the type and others merely in the design. In the most commonly known design, the difficulty of maintaining tight connections and tight retorts is probably responsible for a great deal more of the shortage of yield as compared with other contemporaneous retort installations than is supposed; the combined leakage from all openings in the installations which I have seen, and heard from, is quite considerable. The trouble from swelling of coal in the filled retort, with distortion of the retorts from this and other causes, including irregular heating, causes frequent hang-ups or bridging of the coke in the retort, and the effect upon the labor situation is to make it worse for the stokers than in many of the old-time hand-operated houses. The theory that gas is protected by its passage through the uncoked core of coal does not seem to be borne out by the results.

The tar, while large in yield, shows a surprisingly small amount of light oils and benzoles, and the candle power of the gas is not as high as would be expected, were this condition met with in their operation. It is well known that there is no way by which the candle power can be stripped from coal gas more easily, than by passing it through heated coke or over extremely hot spots in the retort or oven surface. The disproportion in the candle power found with these verticals may be due to some such division of the travel of gas. Some vertical settings are pretty hot toward the top, and, with the retort tapered, which is considered necessary to overcome the tendency to hang-up in discharging, it is possible that the coking takes place through the upper portion of the charge as rapidly as it does through the lower and thicker portion, and that the uncoked core does not exist for any considerable portion of the coking time. The one installation of continuous verticals has not been in operation here long enough to receive more than our passing interest, with a note to keep an eye on them in the future. The high fuel reported from some of the vertical installations is due to several causes: First, improper design of the producers and difficulty in the uniform distribution of producer gas and secondary air to the setting; second, to the very large radiating surface exposed in this type of installation. Undoubtedly much of this excessive use of fuel can and will be obviated in further installations, through better design. The radiation can also be very greatly reduced, though it will add somewhat to the difficulties, which the designer will have to overcome; and also to the first cost of construction.

The ammonia results are good, tar is large in quantity and good in quality, and the coke is good, comparing very favorably with that from most of the other retort processes.

In horizontals operated by machinery, it seems that the line of development has most definitely and certainly proceeded in the direction of through retorts of moderate length, discharged and charged in the one operation by a single machine. This method is practically restricted to two types of machines now in use. The English machine has not been in operation in this country long enough for us to say very much about its mechanical efficiency or durability, and it has not been developed to anywhere near the refinement of the American type, and it has some defects in the distribution of the charge which it will be quite difficult to entirely eliminate. However, this general type of machine must, I believe, be the one toward which all development of horizontal retorts operated with machinery must progress. The quite remarkable results obtained with these later installations of horizontals with machinery, while startling to many of the older gas men who have seen coal carbonized for several decades without any material increase in yields or change in quality or quantity of gas or residuals, is not so remarkable when analyzed in detail. The conditions for the distillation of all the volatile matter from coal, as any laboratory man can tell you, comprise two elements. Temperature and time; in other words, a very high temperature for a very short time may drive off practically all the volatile constituents in the given sample. Exposure of the same sample to a lower temperature for a longer time will do the same thing, but the condition in which the volatile matter is recovered in the two cases may be very different. In the old-fashioned retort process with partially filled retorts, whether horizontal or inclined, the passage of the gas from the retort was slow, its exposure to the high temperature in the retort was prolonged, and through this heat treatment, there was necessarily more breaking down of the sensitive hydrocarbons in the tar and in the gas, resulting in more lampblack, and in a lower candle power and heating value for the gas. By the newer process with nearly filled retorts, the gas must escape very rapidly from the retort; carbonization at lower temperatures still further protect the gas; and, last but not least, the very uniform heating obtained in some of these modern settings prevents any portion of the gas from coming in contact with extremely hot spots. Avoiding spilling coal and leaving coal upon the cooler portion of the setting walls and mouthpieces to "stew," result in the delivery of pretty nearly the last possible fraction of a foot from every pound of coal that goes in. The reduction in carbonaceous material, found in the standpipes and in the hydraulic mains, adds its further fraction of a foot to the registered yield, and the absolute uniformity of heats and charges possible with the more modern construction and design of benches, controlling devices and charging machinery, do away with that trouble which used to be so disheartening in the older-type houses, of inability to properly proportion varying charges to varying heats; in other words, the yield that is gained on the day shift to-day is not lost on the night shift to-night.

In at least one type of construction now before us the periodic variation of heats, due to cleaning of producers, is practically done away with, and I think any student of carbonizing problems who will admit that each of these little details has been carried out can not be surprised when told that the increase in results, particularly in yield, has been what it is now known to have been.

Radiation, and heat lost in the flue products, have always comprised a great part of the heat from the fuel used. Systematic and apparently successful attempts have been made recently to reduce these, and this reduction of fuel promises one of the largest savings recently mode in costs of operation.

So far I have confined my thoughts to the carbonization of coal in retorts, but to-day the carbonization of coal in bulk in various types of coke ovens and so-called chamber ovens, must be seriously considered. The by-product coke oven is, and has been for many years, a quite efficient device for the manufacture of coke as its primary product. Their efficiency in the production of *gas* as a primary product has not been so uniformly high. To obtain a very great advantage in economy of labor, in the handling and carbonization of coal in large bulk, and to obtain peculiar advantages in the quality of coke produced, have been absolutely essential to their success. They have, however, been developed along lines which did not produce the highest efficiency in other directions. The operating cost per ton of coal carbonized has been steadily reduced, by the increase in the size of charge, length and depth of ovens, etc., but this has only aggravated one of the primary difficulties in all coke oven construction, and that is, the control and uniform distribution of heat to the charge, Improvements in this direction have been made in recent years. The almost universal adoption of silica for linings and flue tiles has greatly improved the heating efficiency of all types of ovens and reduced their fuel account correspondingly, but the problem of uniform distribution of heat has not yet been satisfactorily solved. Every system has its own peculiar conditions, and the adherents of each system will convince you of the extreme difficulty met with in the obtaining of uniform distribution through the system employed by their competitors, but the truth is that they all have their troubles, and to these difficulties may be more or less directly traced the lower initial candle power found in most of the gas derived from by-product oven installations. The excessive fuel required for carbonization is due partly to this difficulty of distribution and partly to the large radiating surface and to the out-of-door exposure which increase radiation tremendously, particularly in northern climates.

In considering coke ovens as a direct source of gas for distribution, one must first consider the coke market tributary to the location, and carefully study what may be done in the way of business development, as with the coke oven plant your largest product is the coke. If this question can be satisfactorily answered the coke oven plant has many advantages; its first costs will be less for a given unit of carbonization, and usually its cost of operation will be less. On the other hand, there are more uncertainties in the operation, than there are with the modern types of retort carbonizing plant. The economical handling of the coke oven plant requires prompt and ample shipping facilities. As soon as it is necessary to stock or rehandle the coke the balance of economy of operation in favor of the ovens is usually lost. We must, therefore, add to all the labor and machine risks of the operation of any plant, those extra risks which may arise from car shortage, weather conditions, or labor conditions of the railroad furnishing the service. In our northern latitudes where every sudden drop in temperature, whether accompanied by snow or not, *increases* our output demand for gas, the coke ovens may confidently be expected to *reduce* their output. With the latest improvements in oven construction (independent producers, mechanical draft, better distribution of heat to the ovens, and many others) it is to be expected that this unfortunate tendency of the outdoor oven will not be so acute as in the older plants; but from the nature of things I do not believe that this type of equipment can be made as reliable in the face of violent changes in weather conditions as the better-protected retort installations are known to be.

When your turn comes to make a choice of the type of carbonizing equipment to be installed, I would not recommend that you attempt to decide, beyond these general features, as to what each equipment will positively give you in the way of results. There are enough responsible manufacturers engaged in the construction and installation of all these types of plant, to enable one to call for absolute guarantees on all of the essential details of operative results. Again, one can call for results, as shown by actual installations in operation for long enough time, to give reasonably reliable basis for figures claimed. Then, careful inspections of such plants will tell an experienced operator much as to troubles experienced in operation. A composite of all these factors should give us a pretty fair picture of what we seek for in the ideal coal carbonizing scheme. To me it looks like horizontal retorts, except where local conditions give coke ovens a decided cost preference. You may decide otherwise; but do not allow apparent popularity, glittering estimates, or claims of any sort, to do your deciding. Go, see for yourself, and when anyone tells you what his system can do, ask him how he intends to prove it.

Discussion.

The President—The first break in New England from the old style of making coal gas and the old hand-operated horizontal back end retorts was, I believe, the coke oven plant at Everett. I will call on Capt. McKay to tell us about those ovens.

Capt. McKay—I cannot imagine that you ask me to speak on the coke oven subject, with the expectation that all the people who are going to build coal gas plants in New England for the next year actually contemplate coke oven construction. However, I want to take advantage of this opportunity to emphasize some points made by Mr. Brown. He states that the problem of the uniform distribution of heat has not been satisfactorily solved; but improvements in this direction have been made in recent years. Those improvements are very pronounced, and progress in the control of the temperature and the distribution of the heat is very great. It has been so successful that we do not feel that the limit of the advance is even yet reached, but it is approaching satisfactory condition. Mr. Brown sums up his opinion by saying: "There are more uncertainties in the operation, in my opinion, than there are with the modern types of retort carbonizing plant." Which seems like a reasonable statement. He says also: "The economical handling of the coke oven plant requires prompt and ample shipping facilities." That is almost self-evident, but unless you think of it with particular care you hardly realize how important the shipping facilities are. We have in our plant a daily carbonization of nearly 2,000 net tons, and we are producing and shipping about 1,500 to 1,600 net tons of coke a day. We have 300 acres of land and 20-odd miles of track in our grounds; 4 locomotives, besides other motive power, and we need them all to take care of the delivery of the coke. We have direct connection with two of the largest railway systems in New England, which helps us; but, even so, there are times when the difficulties of operation are very much increased by the variation of the car supply from the railways. I might also add that we have our own rolling stock, equivalent to practically a day's output of coke; and yet, even with that equipment and the cars that the railways can give us, there are times when we are very seriously pressed to prevent some derangement of the operation. Mr. Brown states that, "As soon as it is necessary to stock or rehandle the coke from a coke plant, the balance of economy of operation in favor of the ovens is usually lost." Of course, a coke oven plant should be operated day and night at its full capacity for the entire year. You do not usually have your gas output distributed uniformly day and night throughout the year, and you see the difficulties that you face. You must have a supplementary plant of some kind. If the coke has not been sold when produced, and have to stock the coke and then have to handle it, your breeze is increasing very rapidly, and the satisfactory service of your customers is more difficult. We have at times stocked 40,000 tons of coke, ane we had to do it economically. I have one other comment to make. The title of Mr. Brown's paper remarks "Coal Gas? Surely." It would appear from the attendance this morning, and the interest shown in these papers, that there is a general agreement with that title. I think it might be well to consider whether the anxiety with respect to the possible discontinuance of the manufacture of water gas is not unduly excessive. The change in the supply and the rise in the price of oil cannot be immediately met, and the conditions of uniform supply cannot be immediately restored, for the reason that there has been a great shortage of water tonnage all over the world. Shipbuilding has not kept pace with the demand. The extraordinary number of freighters that have been lost has had an effect, and last winter this shortage of water tonnage was particularly felt in New England on account of the scarcity of the coal deliveries. There is plenty of oil in the world. The essential thing is to have it brought to us, in such quantities and at such times that we may have our necessary supply uniformly delivered. It takes time to build these tank steamers, and I have information that there are perhaps as many as 50 great tank steamers under construction at the present time in the shipyards of Great Britain. You can see what a difference that is going to make in the means of supply, and necessarily in the price at which we can buy oil, as they are discovering fresh oil fields in fair number. In a reasonably short time the Panama Canal will be opened, which will afford a short cut for convenient and economical transportation of oil from other fields. One of our engineers has recently been on the West coast, and I would like to have him state what he found with regard to the oil supply. Don't understand what I am saying as indicating that the title of Mr. Brown's paper is not correct; but I think that the terror that possesses us at the present time may be somewhat appeased by considering that we are going to get oil, and plenty of it, probably at a reasonable price, and at some reasonably near time. Mr. Fisher has been on the West Coast, and I would like to have him state his observations.

Mr. Fisher—There seems, without question, to be a great abundance of oil on the Pacific Coast, coming largely from Southern California. The process that is used there is extremely simple. At one plant I saw a complete installation that had been put together in 40 days. They told me there was no doubt that that oil could be put into New England, after the opening of the Canal, for not over $1 a barrel.

Capt. McKay—There is one other statement to which I would like to refer. Mr. Brown states that, "In our northern latitudes, where every sudden drop in temperature, whether accompanied by snow or not, increases our out put demand for gas, the coke ovens may confidently be expected to reduce their output at the same time." I am glad to say we do not now habitually encounter that experience. We find that, when the temperature drops to a very low level, provided the air is dry, freezing the moisture out of the gas, increases the surplus rich gas available, and we hope to get to the point where there will be very little difference between summer and winter.

Dr. Wing—I can corroborate that statement. Formerly the coke oven plant did not help us out very much when we had a cold snap. We regulate things better now, on cold days when we naturally expect an increased radiation and more consumption of gas for heating. On rainy days, when moisture falls on to the oven, it has to be evaporated, and high winds cause a fall of temperature. The experience is a good deal the same as it is on a rainy and snowy day when we use fuel for making water gas. We naturally expect that fuel saturated with moisture would give a considerable less yield, although not always so.

The President—The next break in New England came with the inclines built at Lynn. Mr. Prichard?

Mr. Prichard—I don't know that I can tell you anything that you have not heard me tell before, but I am glad to congratulate the New England Association on the two papers that we have had this morning. I do not know where you would find two better men to set forth the advanced ideas in coal gas making than the two we have heard here this morning. You may find a few that are as good, but you won't find any better. I am sorry that Mr. Brown did not give some figures, because we are a gang of "knockers" down here, and we would have been glad to have "knocked" those figures. You know they say that a good weld takes a lot of knocking, and the New England Association would have "knocked" Mr. Brown and Mr. Brown would have "knocked" the New England Association, and the result would have been a weld based on good friendship and good feeling, that would have lasted a great many years and been a benefit to all of us. As he says, it is a thankless task to attempt to quote figures when we have no basis or no standard to work from. The western people talk in tons of 2,000 pounds, while New England people talk in tons of 2,240 pounds. Some people measure their gas with the flat flame, some with a Sugg, and some with a Metropolitan burner. Some of us are running 3 shifts, with high cost of labor, some 2 shifts, with low cost of labor. So if a man says he is making 11,000 feet of gas to a ton of coal, that it is 16-candle power, and he is getting 60,000 per man, you don't know anything about it, because you don't know what a ton is, how he got the candle power, or how his man is working. We get at our place about 90 candle feet, and

it was not long ago that our chemist said to me, "We are doing marvellous work this week; we are up to 100 candle feet." He could not account for it. Things went along very fine for a few days, when my friend Fowler rang me up and asked, "How is it going on with you?" I said, "Wonderful results!" Said he, "I was down to your laboratory last Sunday on my bicycle. I had in my pocket an empty revolver shell, and I dropped it in the middle of your Sugg burner." [Laughter.] So simple a thing as that will increase your candle feet from 90 to 100. In making comparisons we have an approximate standard in this State—that is, we are obliged to make reports to the Gas Commission—and if anyone has the patience and the time he can find out from these reports what candle power any plant distributed, by the average of the tests made by the State inspector; he can read as to the materials used, and also as to their cost. Having some curiosity I went through this process, and I have yet to find records that appear to be better, than those that our inclines are yielding. To be as frank as Mr. Nettleton, I will say we are getting 5½ yield, 90-candle feet, a little over 11 pounds of fuel, and 60,000 per man. A year ago, before I was waited on by a delegation from the labor union, we were getting 90,000 per man. That made a difference of 1½ cents on our labor cost. I noted Mr. Nettleton's remarks regarding the work by gravity and the cost of machinery, but there is another way to look at it. You can put up a million-foot plant for $100,000, or you can put in elaborate machinery, and make it $200,000. In this way you divert y ur operating charge to your capital charge to the extent, we will say, of a couple of cents, perhaps 2½ cents. Whether you can reduce your labor cost to that extent is a question for each one to settle for himself. I fully agree with Mr. Brown that each one must determine for himself the best plant to be used. If we are making 25,000 feet of gas to-day we are not going to put in inclines or verticals or machine-operated retorts; we are going to put in old-fashioned benches. I know a man, a very good past member of this Association, who is putting in a set of inclines, but I know of other men, good members of this Association, who have also put in vertical retorts; and so we go. It is a question of local option and of surrounding circumstances. If you have money and can put it into your capital account, and have skilled men to operate these machines, it is one thing. If you have not the money and have cheap help, such as they have down South, you can do better with another form of retorts. We had a little symposium the other night and a discussion on how to make gas. We agreed with Mr. Brown that there should be a space above the coal for the gas to pass through, a fixed chamber for it. Gentlemen there claimed with verticals that, notwithstanding the plastic mass on top of the coal, there was, with every ton of coal, a hole up through the coal through which this gas would flow. Apparently pressures on this installation are low, but some of them were talking pounds the other night. I think our friend from England got the whole thing right when he said we had not yet digested this matter. I don't think we have thoroughly digested it; but I think we are getting it assimilated.

Mr. Africa—Mr. Brown says: "Coal Gas? Surely. But How?" We believe, and I think Mr. Nettleton has demonstrated that he agrees with us, that all things, as well as coal gas should be made in an upright manner. [Laughter.] We left the beaten path and have been making gas in vertical retorts for more than 3 years. In 1911, a very accurate test was made at our plant. The test extended over 2 weeks, and was continuous night and day. I have here a copy of the results. You will find a full description of the test in the "Proceedings," American Gas Institute, Vol. 6, page 501:

Yield per pound	5.59 cubic feet.
Yield per net ton	11,180 " "
Yield per gross ton	12,522 " "
Average candle power, flat flame	13 47
Average candle power, Sugg-D	16.47
Average candle power, Met. No. 2	18.97
Candle feet, flat flame	75
Candle feet, Sugg-D	92
Candle feet, Met. No. 2	106
Calorific value, per foot	600 B. T. U.'s.
Calorific value, per pound	3,353 B. T. U.'s.

Residuals.

	Per Net Ton.	Per Cent. Coal.
Coke	1,350 pounds.	67.5
Tar (dry)	14.4 gallons.	6.73
NH_3	6.17 pounds.	....

Furnace fuel was 13.27 per cent. of coal carbonized, or combustible charged into furnace, 11.77 per cent. If allowance is made for fuel in ash, this figure would be lower. The benches are exposed to the weather, and at night the thermometer went close to zero. During 1912 it became necessary to make coal gas in some of the old horizontals, so I have a statement covering only 6 months' results of the verticals alone, after they had been in use over 3 years. The average yield per pound for 6 months was 5.53; the candle power with flat flame burner, 14; results corrected for temperature and barometer.

Mr. Ramsburg—In the Manchester gas there was some extraneous nitrogen; in other words, in the yield of 5.57 in that test, which was conducted under my direction, some nitrogen was drawn in and metered, and as each per cent. of nitrogen will reduce the candle feet about 1-candle foot, though the yield is increased somewhat, through the admission of this nitrogen, the candle feet proposition suffers. I wish to call attention to one item in Mr. Nettleton's paper. I have made (somewhat roughly) a weight balance of the results, which shows they are accounting for practically 1,990 pounds of material out of every 2,000 pounds. It seems, then, if they are disappointed on the yield, they must expect to turn something else into gas, or to turn some ingredient, that they are now selling at a less price than the gas. Taking the quantity of coke made, you will find a gain in the amount of fixed carbon between the coke of about 40 pounds. Some of this might possibly be saved in the form of carbon in the gas, for we are anxious to get the carbon of the coal into the gas. I cannot recall any finished coal gas, however, that runs any higher than this in methane and good hydrocarbons. Taking sections of a charge and the gas coming off at a certain time during the charge, of course, you will find very much more CH_4, but as a finished commercial gas, this gas contains more methane than any gas that I know of. I think the Worcester gas is almost as high, so it seems, as far as the products are concerned, that this continuous vertical plant is turning the 2,000 pounds into very valuable products. As to what would happen were they to increase their yield from 90,000 feet of gas per retort per day to 120,000, is an open question. If you increase the yield you must increase the heat, and if you do that, you decrease the amount of carbon in the gas and increase the amount of carbon in the tar and coke.

The President—Mr. Burgi, will you tell us something about verticals in Fitchburg?

Mr. Burgi—For working results on the verticals at Fitchburg I shall have to refer to Mr. Stiles, who has been running the plant lately. All I can tell is that it is working all right. There is in course of construction, a duplicate of one which we first put in, that will be in operation some time this summer, and we hope to get even better results than out of the one we are now operating.

Mr. Stiles—Our plant has been operated since January 7, 1912, and is still running in good shape. Some of the results we have gotten on tests are:

Average for Week Ending November 7, 1912.

Daily make	279,000 cubic feet
Make per mouthpiece	34,857 " "
" " man	139,428 " "
" " pound of coal	6.13 " "
Candle power. New D. Argand Burner, 7-inch chimney	14.6
Candle feet	89.4
B.T.U	600 8ross
Specific gravity	.402
Tar per gross ton	15.0 gallons
Specific gravity	1.107
Free carbon	1.15
Ammonia	5.75 lbs.N.H, per ton

Mr. Taussig—I was very much impressed with Mr. Brown's paper. We all recognize that he knows as much about coal gas as anybody else in the country, but my impression on reading his paper was similar to that on recollecting the two boys saying to each other, "My daddy can lick your daddy!" Mr. Brown is familiar with his "daddy," and knows all there is to know about it; but I believe Mr. Brown has admitted it is possible for him to learn a little more about other systems of coal carbonization. I think it likely that, in the future, if Mr. Brown made a more thorough study of some other systems, he might be willing to change his mind about the proper way of making coal gas. I happened to be present at a dinner (which Mr. Duckham referred to) the first night I was here, at which I was pretty nearly fried, griddled and stewed. [Laughter.] We discussed there this whole problem, and I did my best to convince this scientific party, which included such scientists as Messrs. Collins, Norton, etc. It was no easy task, although I don't dispute their high technical ability, that the law of gravity was the proper thing for the coal gas manufacturer, for it simplifies the whole problem. In building big power stations nowadays, they are discarding reciprocating engines and putting in steam turbines. Why? You know very well they can build reciprocating engines with very high efficiencies; and there is very little difference between a large unit of reciprocating steam engines, as far as efficiency is concerned, and the large turbine units. What are they trying to do? Why, to eliminate the moving parts; to take up less ground space. They are going into the refinements of engineering; that is what we are trying to do; and that is why we are going into the vertical retorts. We cut out all that massive machinery which requires expert machinists to look after, which requires men to be on tap to get on the job when things go wrong. Now, what do you have in a vertical retort? We have a plant that is set up on edge, where the coal drops in by gravity, and where the coke comes out by gravity. Go to the leeward side of a horizontal retort house on a nice, sunshiny day in July; what do you get? You cannot get out of the heat and you cannot find a place in the retort house less than 120° What do you get in a vertical retort plant? You are sitting on top of a platform, across which the breezes gently blow. Take the little plant we have been experimenting with in Philadelphia; the coolest place in Philadelphia during certain days last summer was right on top of that retort house. Why? Because there was an induced draft blowing across the place that made it comfortable for everybody. I believe the future of coal gas manufacture is to make it as easy and simple for the men as possible. I do not say that some of the horizontal plants are not doing so. They have the machinery and a practical plant, and they have brought the operating costs about as low as one can get with the verticals; but there is still room for improvement. Vertical retort plants will not take over half the room of a modern horizontal retort plant, which is a feature that must be considered in some locations.

I believe when we wake up the trend in coal gas manufacture in the work is going to be towards vertical retorts. See what they are doing abroad. Tearing out inclines, horizontals and the like, putting in vertical retort plants. Why are they doing it? They have scientific men to look into the matter. You will be doing it too before long.

Mr. Ellis—For the Providence Gas Company, I can say that we are very proud we were the pioneers in vertical retorts in this country. We have made another contract for a million per day of the new improved, rows-of-three, 6 benches of 16 retorts each, to be discharged by hydraulic power, and with the improved furnaces we hope soon to give you something very enlightening on the question of vertical retorts. We still have faith in them, and believe we are going in the right direction.

Mr. Forstall—I am in the unfortunate position of being a "has-been" in this matter of coal gas, as far as any personal experience is concerned. I thought I knew something about running a retort. I got out of the retort house so many years ago that my knowledge at present is theoretical, and I don't know that it is worth very much in view of the practical experience that has been given. There are a couple of points in Mr. Brown's paper that I will take up. One is the statement that, "A very high temperature for a very short time may drive off practically all the volatile constituents in the given sample or charge of coal. Exposure of the same sample or charge to a lower temperature for a longer time will do the same thing." From some work that I did in a testing plant in Chicago a good many years ago, I am inclined to doubt that statement. I don't think that the lower temperature, no matter how long the exposure is continued, will drive off as much gas from a given sample of coal, as will exposure to the higher temperature for a shorter time. I may be wrong about that, but these tests made me think that you could take coke that had been kept in a retort at a low temperature until the gas absolutely stopped coming off of it and put it in a retort at a higher temperature, and still get some gas from it, and that partly accounted for the difference in yield between low and high temperatures of carbonization. Another point is the statement that the first cost of a coke oven plant will be less for a given unit of carbonization. What is the unit of carbonization? I don't think it is the 1,000 cubic feet of gas made per day, or else the coke oven people have been trying to fool me on some figures given me lately, in which they specified the make per day. Just to reassure Capt. McKay that we are not all in a state of terror about the oil situation, I may say I have not the slightest feeling of anxiety about the cessation of the manufacture of carbureted water gas in the larger plants. I only hope that the larger plants will cease to manufacture water gas, because then perhaps I may have a chance to get some cheap oil again. Now, as to the price of oil, and the probability that it will decrease with the opening of the Panama canal and the building of tank steamers. A very illuminating piece of information on the oil question is the report of the Geological Survey as to the stocks of oil on hand in the United States on January 1st, 1912, and January 1st, 1913. At the beginning of 1912 there were 81,000,000 barrels and at the end of 1912 there were 69,000,000 barrels in stock. Oil in Seattle is selling at about $1 a barrel now, and when it comes through the Panama canal, and around here to the seaboard, it will be at a higher price than that. When carried inland as far as Chicago, the price will be still higher, so my view of the situation is, that while the upward trend of prices will probably stop, and there will be a downward turn in the next few years, oil prices will never get back to where they have been. That we will never again get good oil for 3 cents a gallon in this part of the country. Mr. Ramsburg seemed to think that if in Derby the yield per bench was increased to 120,000 feet per day, the quality of the gas would be decreased; but I don't think that follows. The increase in yield per bench is largely a matter of passing more coal through it, and when more coal is passed through just keep up the temperature of the retort. It is a case of transmission of heat through the retort material. The temperatures outside and inside the retort will not be any higher, but more heat gets through in a given space of time without any greater drop in temperature. I don't think quite enough has been said as to the great modifying effect of local conditions upon the choice of systems. I think that can best be illustrated by citing an extreme instance. The city of Belfast, Ireland, several years ago built a large horizontal retort house. The house happened to be alongside the bleaching ground of a linen manufacturer, who, finding smut on his cloth, promptly clapped an injunction on the retort house and prevented its operation. The city is now operating continuous verticals, and will probably escape any complaint from the linen man. In another locality conditions might favor horizontals as against verticals.

Mr. Ramsburg—In connection with Mr. Forstall's statement as to the flow of heat through a retort. It seems that on further thought he will qualify his statement, for it is necessary to have a higher heat head in order to get an increased flow of heat during a given time. In order to increase the flow of gas from these continuous vertical retorts, it would be necessary to have, perhaps, not a proportionately higher heat, but certainly an increased heat on the surface of the retort, to increase the make from 90,000 to 120,000 feet. As to the yield of gas from different temperatures to which coal is subjected, I should like to read one or two paragraphs from a series of lectures delivered before the Royal Society of Arts by Prof. Vivian B. Lewes. He said: "With a good Durham coal (capable of yielding 11,000 cubic feet of gas and 10 gallons of tar per ton, when distilled under ordinary conditions, at a temperature of about 1,000° C.), it is found that, on carbonizing at 600° C., it yields only 5,000 cubic feet of gas, but 22 gallons of tar per ton, and the residue, on continuing the distillation at 1,000° C., yields a further volume of 4,500 cubic feet of gas, but no tar; so that removing the gas first formed, and the tar vapor from the secondary reactions induced by high temperature, have reduced the gas yield by some 1,500 feet per ton, and increased the tar yield by 12 gallons. An examination of the tar shows that the 12 gallons gasified by direct distillation at high temperatures, consist of the lighter portions of the whole of the tar, which, at this temperature, is capable of producing 1,200 cubic feet of gas, leaving 300 cubic feet to represent the volume gained by degradation of gaseous hydrocarbons and deposition of free carbon, of which the high temperature tar contains 25 to 35 per cent. In other words, if you divide the carbonization into two periods, in which you first take the gas at high temperature, you get a reduced make, due to the fact that, when you combine the two, there is an interaction between the gas and the tar vapors. It may be taken in round numbers that, when 11,000 cubic feet of gas are obtained per ton of such a coal, 45 per cent. of the volume is from the low temperature distillation; 42 per cent. from the residues left in the low temperature coke distilled at a high temperature; 13 per cent. from the various secondary reactions with the tar." This is the result of a series of experiments which Prof. Lewes gave in his lectures, and it seems very conclusive that, when you conduct distillation quickly at high temperature or slowly at low temperature, your results are very different.

Mr. Forstall—I think the gentleman did not quite catch my point, which was that there would be a smaller thickness of material for the heat to go through, therefore, with the same difference of temperature on each side of that smaller thickness, you would get more heat through in a given time.

Mr. Russell—I desire to correct a statement made by Mr. Taussig. As a gas man who is familiar with electric light operation, I wish to state that the reason for our change from reciprocating engines to steam turbines is we can get a much greater efficiency. We accomplish something in the matter of floor space, but certainly we are not tearing out three 1,500-K.W. generators, and putting in improved steam turbines as a matter of floor space alone. The efficiency of the latest steam turbine is nearly double that of the best type of reciprocating engine. The yield of gas very largely depends on the decomposition of the products into carbon and hydrogen. The nearer you approach the decomposition of the coal into those elements the higher will be the gas yield. That is beautifully illustrated in the California oil gas process, which simply depends on the decomposition of the oil into its constituent elements. If you break down the hydrocarbons into hydrogen, a greater yield is obtained, because the specific gravity of the hydrogen is very much less, and the volume it occupies is very much more, for a given weight, than any other constituent, and the greater the yield the more hydrogen and the more carbon formed.

Mr. Ramsburg—I would like to ask the President if he will not tell us something about the Worcester results during the past year.

The President—I have got too much talent here to do any work myself. I have not much to say besides what I said in my address; that we ran the horizontals from October, 1908, until February 1, 1913, and in the 52 months each retort made over 24,000,000 cubic feet of gas. The stack was let down and only the bottom tiles are being replaced. We will start again the first of June, and with the bottom tile of the retorts repaired, I see no reason why we cannot get at least 3 years' more work with these benches. Mr. Brown will answer the questions?

Mr. Brown—I wish to register my conviction that Capt. McKay is right in his first statement as to oil supply. The oil supply for the future is dependent upon many fields that have not been touched, or haven't been worked to anything like their capacity, that I do not believe these high prices can exist for any great length of time. I would not even say that there will be 3 years, as Mr. Forstall suggests, before production will be so great that prices must come down. I doubt, however, that we will ever see them as low as before. In the meantime the tremendous stimulation of the production of coal gas is, necessarily, going to give the coal men the opportunity for which they have been looking, and we are going to pay more for coal. Whether these two approaching lines are going to get so close that the disproportion in the capital investment required, for water gas and coal gas, will allow us to figure the final results on a parity or not, I do not know; but I do think that this unrest that gas men show in the presence of the recent calamity is not entirely justified. Most of you who have water gas plants must continue to make water gas. I know that one of the large cities of this country is figuring to make coal gas on a large scale, and yet, if they do carry out some of their tentative plans, the increase in their sales in all probability will wipe out the coal gas capacity before it has been put into operation, so they will make more water gas the next three years than they have made in the past, although their plans for the extension of coal gas are quite extensive. Another thing that strikes me very forcibly is the small proportion of the oil used for gas. I have heard figures as to the proportion of the total oil taken from the ground that is used in the manufacture of gas. In Milwaukee we are not using oil for gas manufacture, but if we were making all our gas from oil, and our sales per capita are a little over 8,000 probably, the oil we would use would be but a small per centage of the oil that was used in Milwaukee last year. Now, just think. What effect is this price change going to have? It will absolutely prohibit many of our manufacturing concerns from using oil. I know three manufacturers that used over 36,000,000 gallons of crude oil last year. Now, these people have to stop it. They are putting in producer plants and are experimenting with all sorts of schemes. After they have put in half a million dollars into a plant to supplant oil, they will not go back to

it at any price that we may expect to see. That very thing has improved the oil situation to such an extent that I do not think any of us realize how much it may affect us. We don't know the capacity of the unworked fields in Southern Russia, Borneo, Western Canada, Utah, Wyoming, and Southern California; and the flow of capital to those fields will be so stimulated by the present prices that I think we may expect positive results very soon. Capt. McKay mentioned that there are 50 oil steamers under contract to-day. One of our friends from England told me that an investigation, made recently by one of the governmental departments, had shown that there were under contract, in England and a few Continental ports, over 100 tank steamers; and I don't think he included in that some 22 under contract in this country. I note that Capt. McKay's ovens have got out of the habit of decreasing their sendout at the time they want the most gas, which is quite an achievement; but I wonder whether his definition of cold weather (and mine) would be the same. We don't consider it really cold until it gets down to 20° below zero, with a northwest wind of 20 miles an hour, and 12 to 18 inches of snow. I wonder how his ovens would behave under those conditions. Mr. Prichard's statement about the balance of capital charges against labor and maintenance: In writing the paper I fully intended to express my belief that this was a very great question to be decided in every case, but apparently I have not made it plain enough. I also agree with him that the supply of dollars often affects the question. Mr. Taussig in the same way. I hoped in writing the paper to bring out more information, and I have gotten a lot. I don't know that I have changed my mind on some things, but I have a lot more information. I am convinced that simplicity is very desirable when it does not take more labor and materials to keep it going, than the less simple. As to gas coming out by the law of G, as he puts it; I have seen it come out by the law of D [Laughter]. The "D" seemed to come from the men with the rod in hand that were operating in such an atmosphere and under such a tempepature that I stood marvelling how they could get men to do it. Out West the man would tell you to take your job and do certain things with it, and he would fade away [Laughter]. Mr. Taussig's bringing up the question of what was being done abroad was unfortunate for his side of the argument. Some of those Continental plants are almost as bad as the ladies with their skirts; they must have a new style about every 5 years, so it doesn't seem to make any difference what they have done with the former plant, the new one has to go in. They never stay with any one of them, I believe, long enough to find out its ultimate possibilities, and if it is not looking for new styles, then it is a very woeful lack of confidence in their own judgment. Mr. Taussig gives them credit for having very great engineering ability over there, and I think that is true. They have a great deal of scientific ability, but there each man wants to build a monument for himself, and they change men often enough so that the grave yard has got to be diversified quite considerably [laughter], or else they haven't any real abiding faith in their own judgment on such matters. As to volatile matter, I agree absolutely with Mr. Forstall, if the variation is considerable. Where variation of temperature is not considerable, I do not agree with him. Of course, the determination of the volatile matter driven from coal in a retort, measured under practical conditions, and the volatile matter from a sample of that same coal in the laboratory, is an entirely different matter. They are not parallel in any sense. In discussing Mr. Nettleton's and Dr. Beardsley's figures on the coke ash, I don't believe we realize the difficulty of sampling the coal and coke. If the coal were uniform, and the coke also, the laboratory work being done with reasonable care, and they did not get within 1½ per cent., one would think it pretty crude work; but I have seen so many samples of coal taken, that varied a great deal more than 1½ per cent. that I do not believe it is possible to hang the question of reliability of results on the sampling of a set of coal samples and a set of coke samples and say it is right or it is wrong because it does or does not check up. Several things have been brought up that show me the evil of too general statements. I don't exactly agree with Mr Russel's statement as to yield. It is not only a question of the gas to which you break down your hydrocarbons, but it is also a question of how much of it you lose in your tar and other places. By the old-fashioned plan they spilled enough tar in the mouthpiece and on the floor, they lost enough coal that was swept out in the ash, they had enough muck dug out of the hydraulic main and out of the pipes, to have materially added to their yield, if the volatile portions which could have been broken up into gas, had been treated in that way. [Applause.]

On motion of Capt. McKay, a vote of hearty thanks was tendered to Messrs. Brown and Nettleton for their very interesting papers.

(To be Continued.)

Items of Interest
FROM VARIOUS LOCALITIES.

Mr. Vincent L. Elbert, Superintendent of the St. Paul (Minn.) gas branch of the American Light and Traction Company, has been appointed General Manager of the parent corporation's gas branch at St. Joseph, Mo., succeeding the late Mr. Kerr Murray Mitchell. He assumed charge in St. Joseph the morning of the 1st inst.

We are informed that Mr. J. H. Stout, who, since the consolidation of the Wenatchee (Wash.) Electric Company with the Entiat (Wash.) Light and Power Company, has been Secretary of the Wenatchee Valley Gas and Electric Company, has been chosen Vice-President of the latter corporation, but will have active service in the gas division thereof. Mr. Fred. Crollard has been elected Secretary, and Mr. R. C. Kennedy, formerly Assistant Treasurer, has been chosen Treasurer.

The Gas Machinery Company, of Cleveland, O., has been awarded a contract, by the proprietors of the La Porte (Ind.) Gas and Electric Company, for two cast iron purifiers, with dry seal covers, complete, with beams and columns for supporting the boxes, hoisting apparatus for handling the covers, and gate valve connections. The La Porte Company will also construct an extension to its existing purifying house, and is also installing a new tar and ammonia washer, to be furnished by the Gas Machinery Company.

We are informed that the Pennsburg (N. J.) Gas Company, which is under control of certain prominent business men of Allentown, Pa., has been reorganized, and that the plant thereof and therefor (the contract for the completion of which has been awarded to the Western Gas Construction Company) will be completed early in August. In completing the reorganization, the officers elected were: President, Chas. S. Kuhnsman, Allentown; Vice-President, Jas. T. C. Krasley, Allentown; Secretary and Treasurer, Claude S. Peitz, Slatington; Manager, E. P. Kingsbury, Allentown. The people of the district are actually clamorous for a gas supply.

Mr. C. A. Learned, General Manager of the Meriden (Conn.) Gas and Electric Light Company, accompanied by his son, Mr. Harold G. Learned (a Junior in the Sheffield Scientific School) sailed from New York, May 31st, per the "Caramania," bound for England. The trip is taken to investigate the current exposition of gas coal carbonizing in England, and the voyagers expect to return early in August.

Whereforf, coal gas plant constructors will not go wide of the mark if the above reminds them that in Meriden will likely be constructed within short time a modern type coal gas plant.

The last week in May the Kentucky Court of Appeals handed down an opinion, on the appealed proceedings involving the right of the Louisville General Council to pass a merger ordinance, under which all the gas and electric lighting interests of that city could be combined. The decision was distinctly clear in respect of the right of the Council to pass such an ordinance, in that its provisions were such as to guarantee the public lighting service of the city at a favorable rate.

The Annual Alumni Day Celebration, by the Alumni of Stevens Institute of Technology, which was brought off last Saturday, at 3 P.M., in beautiful Castle Point, Hoboken, N. J., was a really splendid function. Let us hope that as time speeds the continuously lengthening roll of Stevens' Alumni will positively attest to the growing importance of this surely great institution for tuition.

"B. W. A.," writing from Boston, under date of May 28th, says: "The unfortunate predicament in which the 'Nevins bunch' plunged the old or original Haverhill (Mass.) Gas Light Company, shows no signs of changing for the better. In any event on the 27th the full bench of the Massachusetts Supreme Court, on an information filed by the Attorney General, ordered an injunction to issue restraining the Company from transferring its franchises and property to the newly-formed Haverhill Gas Company, without the consent of the Legislature. The Attorney General (and a hair-splitting argument or objection it certainly looks to many financial men of Boston) alleged that the proposed transfer was a 'scheme' to avoid the sale of stock at public auction, as required by law. The Court holds that gas companies, street railways and kindred corporations, being public service corporations, cannot transfer their properties and franchies, without consent of the Legislature. Meanwhile, the decision is of such nature as to point the way to an eventual settlement of the contention."

On June 1st the net gas rate charged in Quincy, Mass., by the Citizens Gas Light Company, was fixed at $1.20 per 1,000 cubic feet. The Company is also expending quite a sum on plant rehabilitation and on main extensions.

It is again reported that the Washington (D. C.) Gas Light Company is negotiating for the purchase of Analostan Island, whereon it is suggested that, in the near future, a modern new plant will be constructed. The Island covers 117 acres, and is admirably located

for the purpose said to be in view. The Company will, whether or not it selects Analostan as its future plant site, shortly have to secure a location, in view of the fact that the authorities are proposing to condemn the West station, to add the underlying land to the Rock Creek-Potomac Park conservation. As usual, the Company's management denies any knowledge that negotiations of the nature suggested are even underway.

THE Nashville (Tenn.) *Tennessean* declares that Mr. B. B. Coombs, General Manager of the Nashville Gas and Heating Company, who is taking the "booster trip" for reasons purely patriotic, has made a first-class booster. "The line of 'talk' which Coombs has been giving," so also says our authority, "has been anything but gas!"

IN compliance with an ordinance decreed by the Common Council of Binghamton, N. Y., Mayor Irving recently forwarded to the Public Service Commission, Second District, a complaint averring that the gas rate in the named city should not exceed $1 per 1,000 cubic feet. The rate now is not in excess of $1.10, which looks a most reasonable one.

THE Massachusetts State Board of Gas and Electric Light Commissioners has granted the petition of the Westfield Municipal Light Board that it be permitted to put the selling rate at $1 per 1,000 cubic feet to all users. Heretofore the net rate has been $1.10 per 1,000; gross, $1.30. The rate for electric current was also reduced.

MR. THOMAS HENRY BROWN, a lawyer residing in Jersey City, N. J., acting for certain residents of Ocean Grove, N. J., has forwarded a complaint to the Utilities Board that the rate charged for gas in Ocean Grove ($1.50 per 1,000) is unreasonable. The gas service to the Grove is made by the Coast Gas Company, from its Belmar station. This complaint is surely an odd one, when the history of the case is recalled. The religious corporation, that so profitably operates this noted summer resort, constructed and operated on Company account an electric lighting plant. When the Consolidated Gas Company, of New Jersey, sought the right to pipe gas from Long Branch to the Grove, the petitioners were voted out-of court on the ground that a gas supply would materially diminish the profits of the electric annex to the Temple; on the same ground, a franchise for a separate gas company for the Grove failed of passage. Finally, the demands of some of the faithful (not shareholders in the corporation) for gas became so insistent that an arrangement was made with the Coast Gas Company whereby the latter would maintain a supply. In order to make secure the profits of the electric end of the game, however, it was specified that the charge of $1.50 per 1,000 should rule. Of course, the Belmar-Maloney combination was not averse to this, and a good gas service was kept up under the arrangement. And now comes the sequel. The hewers of wood and drawers-of-dollars (meaning the summer cottage renters) not in the Grove corporation, and not caring whether the latter made or lost money in the operation of the electric plant, but anxiously wanting gas for cooking purposes at a reasonable rate, have appealed to the Utilities for relief. The way out-of-it is for the Grove Corporation to build and operate its own plant, if it is not inclined to make a sensible arrangement with the Maloney syndicate, and thus get every cent that can be made out of the lighting and fuel situation as that exists in the famed watering place.

MR. C. J. DEEMERS, formerly in the sales' division of the Wilmington (Del.) Gas Company, has been appointed Commercial Manager, the Standard Gas Company, of New Jersey, with headquarters in Keyport.

MR. G. R. STETSON, General Manager of the New Bedford (Mass.) Gas and Edison Light Company, will journey with the members of the Society of Mechanical Engineers, who are to be the guests of the German Society of Mechanical Engineers during the meeting of that body abroad this month. The party sails from New York to-morrow, on the steamer Victoria Louise. Mr. Stetson will later on travel through Germany, France and England, on a tour of inspection of the prominent gas plants, and proposes to return home by Sept. 1st.

CONSTRUCTION work on the new gas plant for St. Johns, Mich., will be commenced some time in July.

MR. CLEMENT C. SMITH, President of the Wisconsin Public Service Company, recently submitted to Commissioner Erickson, of the State Railroad Commission, the following revised schedule of rates concerning its gas supply service in Green Bay: For the first 1,000 cubic feet per month, $1.25; $1.20 for second 1,000; $1.15 for third 1,000; $1.10 for the fourth 1,000; and $1.05 for the fifth 1,000 and all thereover. Prompt payment (within 10 days) to entitle the user in each quantity scheme to a rebate of 10 cents per 1,000.

MR, WILBUR GLEN VOLIVA, representing the people of Zion City, has applied to the Circuit Court for the district, restraining the North Shore Gas Company, of Illinois, from extending its mains to and through the biblically named settlement. Mr. Voliva does not object to a gas supply, if that supply is controlled by the "proper party;" and, of course, in Zion City, who is superior to Voliva?

"B. V. C.," writing from Philadelphia, under date of the 31st ult., incloses this: "Last Wednesday a meeting of the Directors and bondholders of the South Delaware Gas Company was held in Seaford, Del., and the session concluded by an order that the corporation be placed in the hands of a receiver. Messrs. Chas. Vanteer, W. H. Stevens and B. R. Kenney were appointed a committee to file with the Court of Chancery an application for such official. The South Delaware Gas Company was organized in 1911, with a capital stock of $100,000, and a gas manufacturing plant and distribution system were forthwith constructed at a cost said to be equal to the capitalization. The Company did not prove a paying organization from the start, but about a year ago a controlling interest in it was purchased by a Mrs. B. B. Ross, who is said to have paid $55,000 therefor. It is asserted by her that, although its affairs have been managed in most efficient and modern manner, it is impossible to put them on a profitable basis, hence the request for a receivership.

LATER information respecting the above is to the effect that Chancellor Curtis has appointed Messrs. H. M. Tracey and Edward J. Winder as Receivers for the Company, Mr. John M. Tunnell appearing for the Company. Messrs. Kenney & Folk represented the stock and bondholders of the corporation.

"R. V. M.," writing from Rock Hill, S. C., under date of the 29th ult., says: "All doubt about how the ratepayers of this place stand, in respect of granting a franchise for the construction and operation here of a gas plant, was well dissipated when the votes cast in special election as to grant or no grant were counted. The ayes had 194; the noes, 4. The maximum net rate ($1.50 per 1,000) looks rather high, but if the corporation proves a 'paying go' from the outset, a revision of the schedule will likely not be difficult to secure. The people in charge of the prospect (Messrs. Kuemmerle & Co., Philadelphia) assert that the plant will be in operation before Christmas time this year."

MR. HATHAWAY, Assistant General Manager, and in charge of the gas division of the gas properties in Norfolk, Va., of the Virginia Railway and Power Company, recently said to a reporter of the Norfolk *Pilot* that a new coal gas plant would be constructed forthwith; that the future practice in gas making there would be virtually reversed. That is, to-day the output is 20 per cent. coal gas and 80 per cent. water gas; hereafter, or when the new coal gas plant is completed, the ratio will be: Water gas, 20 per cent.; coal gas, 80 per cent.

AT the annual meeting of the Fort Plain (N. Y.) Gas and Electric Light, Heat and Power Company the officers elected were: Directors, J. L. Moore, Andrew Dunn, L. M. Weller, W. E. Diefendorf and A. D. Sheffield; President, A. D. Sheffield; Vice-President, W. E. Diefendorf; Treasurer and Secretary, Andrew Dunn; assistant to the latter, A. G. Dunn.

WE regret to have to chronicle the death of Mr. James J. Duncan, Metallurgist for the U. G. I. Company, who passed away, at his home in Philadelphia, the morning of the 26th ult. Deceased, who was in his 56th year, was a grandson of General William Duncan, whose services to his country merited special mention more than once during the War of 1812. Deceased was a Civil Engineer and was well-known in the field of metallurgy the world over, for discoveries therein, at least one of which has been largely utilized by the smelting men of current times. He represented the Government in a number of investigations along metallurgical lines both at home and abroad. He was of the likeable sort and his friends were many. He is survived by his widow, a son and a daughter.

ELSEWHERE in these items will be found an intimation that the Washington (D. C.) Gas Light Company was about to purchase Analostan Island, but that the corporation's authorities denied any knowledge of such intention. Now we have it that President Leiter has concluded the negotiation, and that the price paid was $80,000.

MR. GEORGE H. WARNER, Treasurer and Secretary of the Wm. M. Crane Company, sailed for England last Saturday. He proposes to return early in September.

The Market FOR GAS SECURITIES.

The market for city gas shares shared in the general weakness that characterized doings on the Exchange during the week. Meanwhile, observers should not overlook the fact that the stiffest thing on the list was Consolidated. It did get below 130 several times, but its stay at under 30 was in each instance short. The Hebraic element on the Board, who in times past always took a "short shot" at Consolidated when things were in the dumps, having so often felt the recoil of the shooting piece, seem this time to beware of the kick-back. The opening to-day (Friday) was 130 to 130¼. Another evidence that matters are coming to the consolidating measure would seem to be in the fact that the city is virtually to take over the old Municipal works site.

Brooklyn Union, strange-to-say, was very ragged in the interim, and the low figure of 126½ was made in it a day or so ago. To-day it is 126½ to 129. It would be cheap at 150. Peoples, of Chicago, is 106½ to 107, which is rather low for a 7 per cent. security, and the like remark (only with greater force) applies to Lacledes, both common and preferred.

Mr. Robt. J. Graf, Secretary of the Standard Gas and Electric Company (parent office, Chicago) announces a quarterly dividend of 2 per cent. on the shares, payable the 16th inst. The American Public Utilities Company, of Grand Rapids, Mich., keeps up its excellent record. Its earnings, net, and available for dividends on the common up to April 30th last, show a surplus equal to 7 per cent. on its common stock. So, if it can show 7 per cent. in 7 months, it is a certainty that it can earn and pay 10 per cent. on it for the 12 months.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

JUNE 9.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par alue of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	130	130¼
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	63
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	96	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	103	104
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	126½	129
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¼	107
Yonkers	399,650	500	130	—
Out-of-Town Companies.				
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	22,500,000	100	87	90
Essex and Hudson Gas Co.	6,500,000	—	123	126
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,250,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	130	133
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	7	10
" Bonds, 5's	2,650,000	—	90	93
Jackson Gas Co.	250,000	50	32	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	26
Bonds, 1st 5's	3,822,000	1,000	96½	99
Laclede Gas Co., St. Louis.	10,000,000	100	90¼	91½
Preferred	2,500,000	100	99	102
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	88½	89
Preferred	25,000,000	100	87	89
Montreal L. H.& P., Canada	9,000,000	100	224½	227
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	5,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	188	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	106½	107
1st Mortgage	20,100,000	1,000	103	103½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
Pacific Gas and Electric Co.	15,500,000	—	53	54
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	98	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	423	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, Richmond, Va., October 15-17, 1913. Officers: President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 8, 1913. Officers: President, C. G. M. Thomas, Long Island City, N. Y.; Secretary, C. H. B. Chapin, 39 W. 39th street. New York City.

Gas Meeters.—Monthly Section Meetings; Grand Commissioner, I. W. Peffly, New York; Gen'l Sec'y, H. Thurston Owens, La Crosse, Wis.; New York Section, Chairman, Will W. Barnes; Secretary, John M. Brock, 204 Percy street, Flushing, N. Y. Philadelphia Section; Chairman, L. R. Dutton'; Secretary, H. F. Patterson, Jr., 833 Chestnut street. Cleveland Section, Chairman, F. R. Hutchinson; Secretary, Wm. Holtz, East Ohio Gas Co. New England Section, Chairman, F. M. Roberts, Haverhill; Sec., F. K. Wells, 69 Broad street, Boston. Winona Section, Winona, Minn., W. F. Clausen, Chairman.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 18th and 19th, 1914. Chicago. Ills. Officers: President, W. F. Barrett, Chicago, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,———— September, 1913. Meetings of Sections, monthly. Pres., Preston S. Millar; General Secretary, J. D. Israel, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March —— —— 1914. Terre Haute. Officers: President, A. S. Cooke, Terre Haute; Vice-President, A. C. Blinn, Evansville; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, May, 1914; ———— Officers: President, B. C. Adams, Lincoln, Neb.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1913. ———— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association—Annual meeting, September, 17, 18, 19, 1913; ———— Officers: President, W. S. Blauvelt, Detroit, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and gas show, Dec. 1-6, 1913. Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, St. Louis, Mo., May 19 and 20, 1914; Officers: President, E. L. Brundrett, Kansas City, Mo.; Secy-Treas., T. Clive Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 18th and 19th, 1914, Boston. Officers: President, T. H. Hintze, Providence, R. I.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting, July —, 1913, Asbury Park N.J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City, May, ——1914. President, F. E. Bowman, Ada; Secretary-Treasurer, H. V. Bozel, Oklahoma City.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18, 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ———, 1914; Officers, President, J. A. Frick, Allentown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Mobile, Ala., April 4, 1914. Officers: President, James Ferrier, Rome, Ga.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May 21, 22, 23 and 24, 1913, Galveston, Tex. Officers: President, F. M. Lege, Jr., Galveston, Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 14 and 15, 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.